ENGINEERING TEST REPORT

Portable/Handheld Cellular Phone
Model No.: 1100A

Tested For

New Horizon Technologies International, Inc.
5575S Sermoran Blvd., Suite 30
Orlando, FL
USA, 32822

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.: NHT-001-SAR

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: March 18, 2002	
Report Prepared by: JaeWook Choi Issued Date: March 18, 2002	Tested by: JaeWook Choi Test Dates: February 26, 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 "

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT AND MANUFACTURER INFORMATION

APPLICANT:	
Name:	New Horizon Technologies International, Inc.
Address:	5575S Sermoran Blvd., Suite 30 Orlando, FLah USA, 32822
Contact Person:	Ms. Karen Wilson Phone #: +1 407 736 9220 FAX #: +1 407 736 9269 Email Address: nhtikaren@aol.com

MANUFACTURER:	
Name:	New Horizon Technologies International, Inc.
Address:	5575S Sermoran Blvd., Suite 30 Orlando, FLah USA, 32822
Contact Person:	Ms. Karen Wilson Phone #: +1 407 736 9220 FAX #: +1 407 736 9269 Email Address: nhtikaren@aol.com

2.2. DEVICE UNDER TEST (DUT) DESCRIPTION

The following is the information provided by the applicant.

Brand Name	Cuclone
Product Name	Portable/Handheld Cellular Phone
Type/Model Number	1100A
Serial Number	Pre-production
Type of Equipment	Cellular Telephone Services
Antenna Type	Integral
External Power Supply	N/A
Primary User Functions of DUT:	Voice communication through air

2.3. LIST OF DUT'S ACCESSORIES

N/A

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

The original EUT was unable to comply with the FCC limit for general population category at certain channels even though the conducted output power level of EUT was adjusted down to 24.0 dBm. Therefore the modifications had been made in order to reduce the peak spatial-average SAR.

A general purpose EMI/RFI shielding spray[*](conductive nickel coating) was applied to the inner side of the front case as a modification. This was found to reduce the peak spatial-average SAR by 40 % approximately.

Refer to EXHIBIT 6. for more details.

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

A laptop computer and a test jig are used to configure the channel frequency and test mode of the EUT.

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.

[*] "Super Shield Conductive Coating (CAT.NO. 841-340G)" manufactured by MG Chemicals (http://www.mgchemicals.com) was applied.

2.7. SPECIFIC OPERATING CONDITIONS

N/A

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:

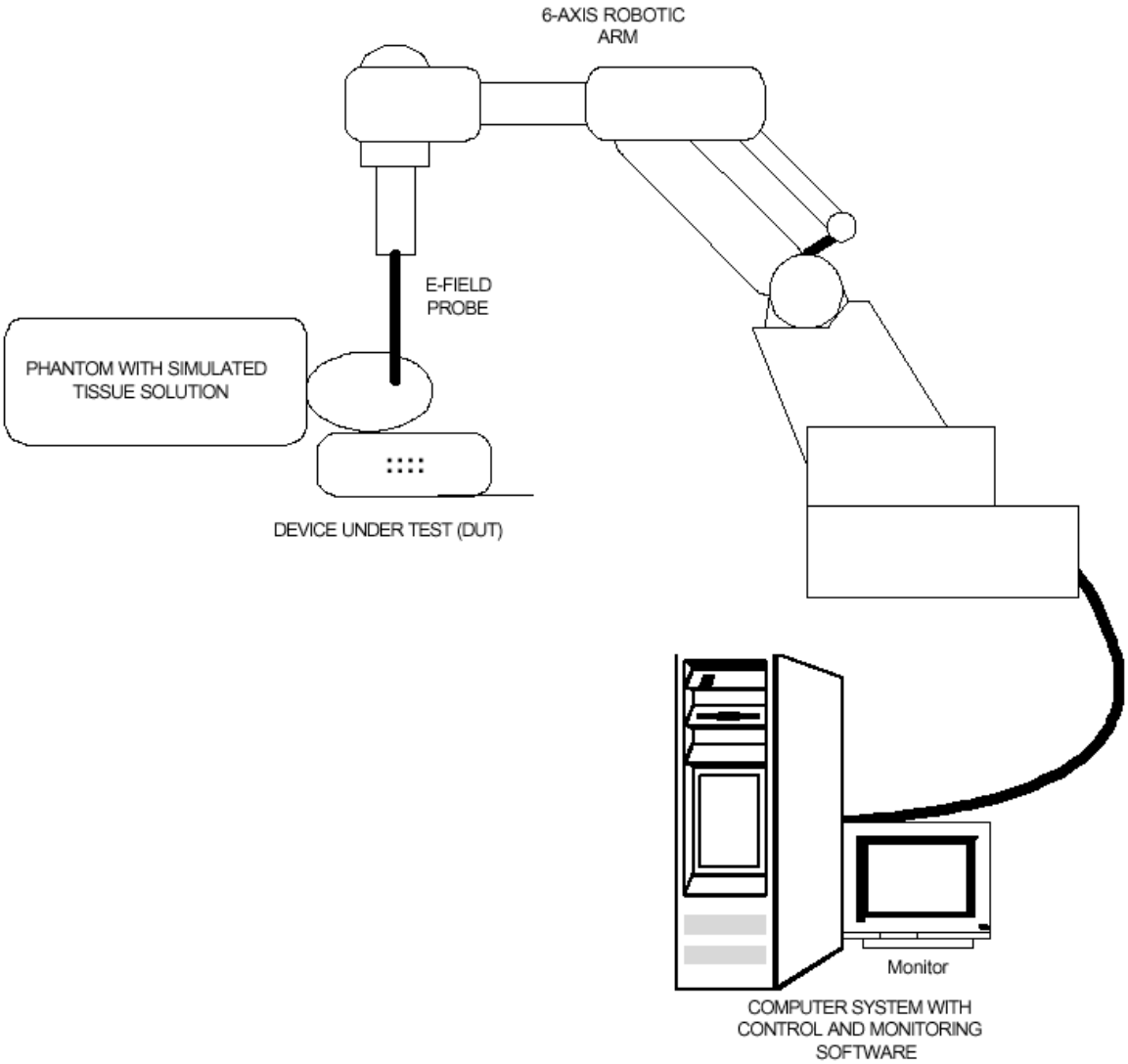


EXHIBIT 4. MEASUREMENTS, EXAMINATIONS & TEST DATA

4.1. TEST SETUP

EUT Information		Condition	
Radio Type	Cellular phone	Robot Type	6 Axis
Model Number	1100A	Scan Type	SAR - Area/Zoom
Serial Number	Pre-production	Measured Field	E
Frequency Band (MHz)	824 – 849	Phantom Type	Head Left/Right ear
Frequency Tested (MHz)	824.0, 836.5, 849.0	Phantom Position	Cheek, Tilt
Nominal Output Power (W)	0.355 conducted	Room Temperature	21 °C ± 1 °C
Antenna Type	Integral	Room Humidity	35 % ± 10 %
Signal Type	CW	Tissue Temperature	21 °C ± 1 °C
Duty Cycle	100%		

Type of Tissue	Brain
Target Frequency (MHz)	835
Target Dielectric Constant	41.5 ± 5%
Target Conductivity (S/m)	0.90 ± 5%
Composition (by weight)	DI Water (41.79 %) Sugar (56.46 %) Salt (1.46%) HEC (0.15 %) Bactericide (0.15%)
Measured Dielectric Constant	43.5
Measured Conductivity (S/m)	0.970
Probe Name	E
Probe Orientation	Isotropic
Probe Offset (mm)	2.25
Sensor Factor	10.8
Conversion Factor	0.974
Calibration Date (MM/DD/YY)	01/31/2002

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 **1.065 W/Kg**

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

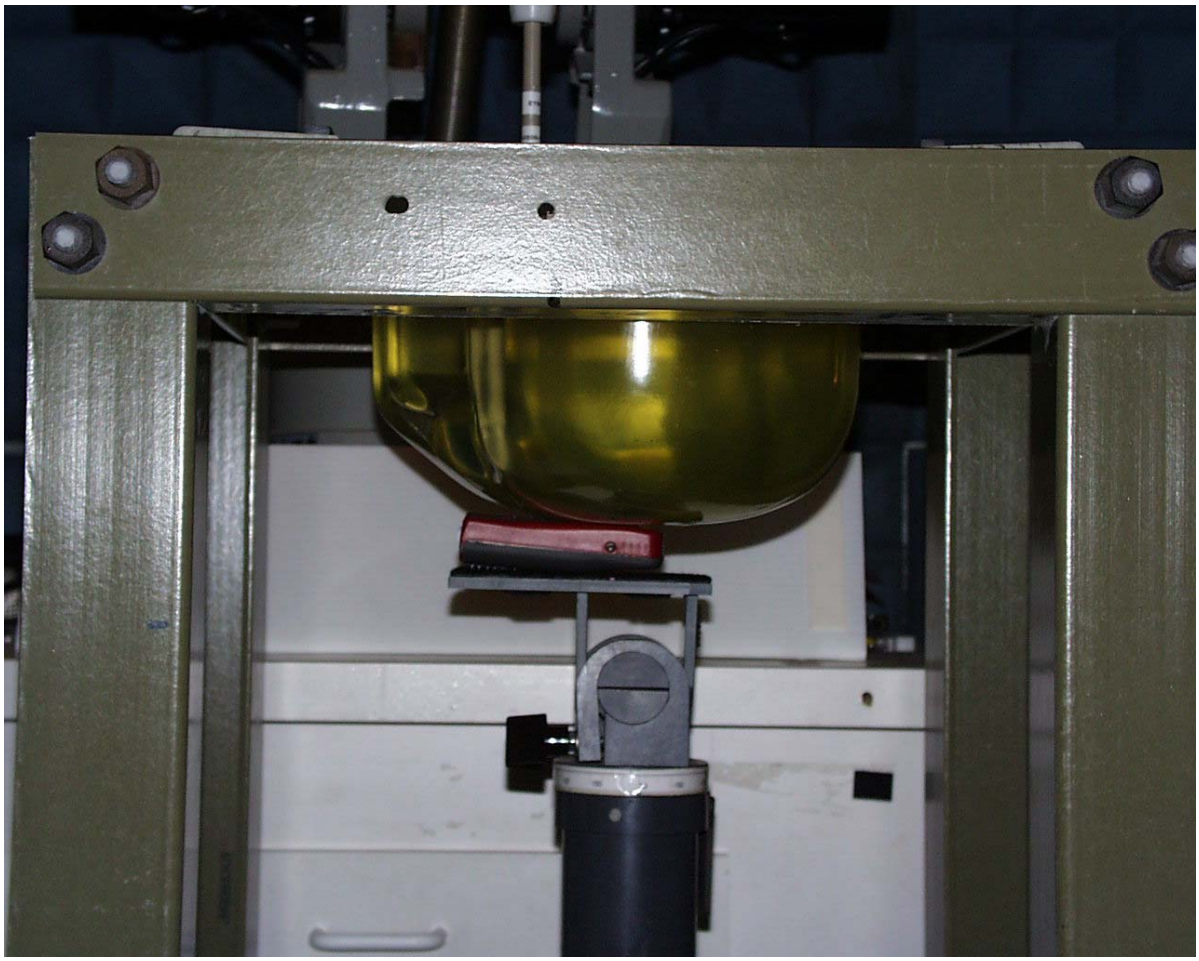
4.2. PHOTOGRAPH OF EUT WITH ALL ACCESORIES

<Front View>

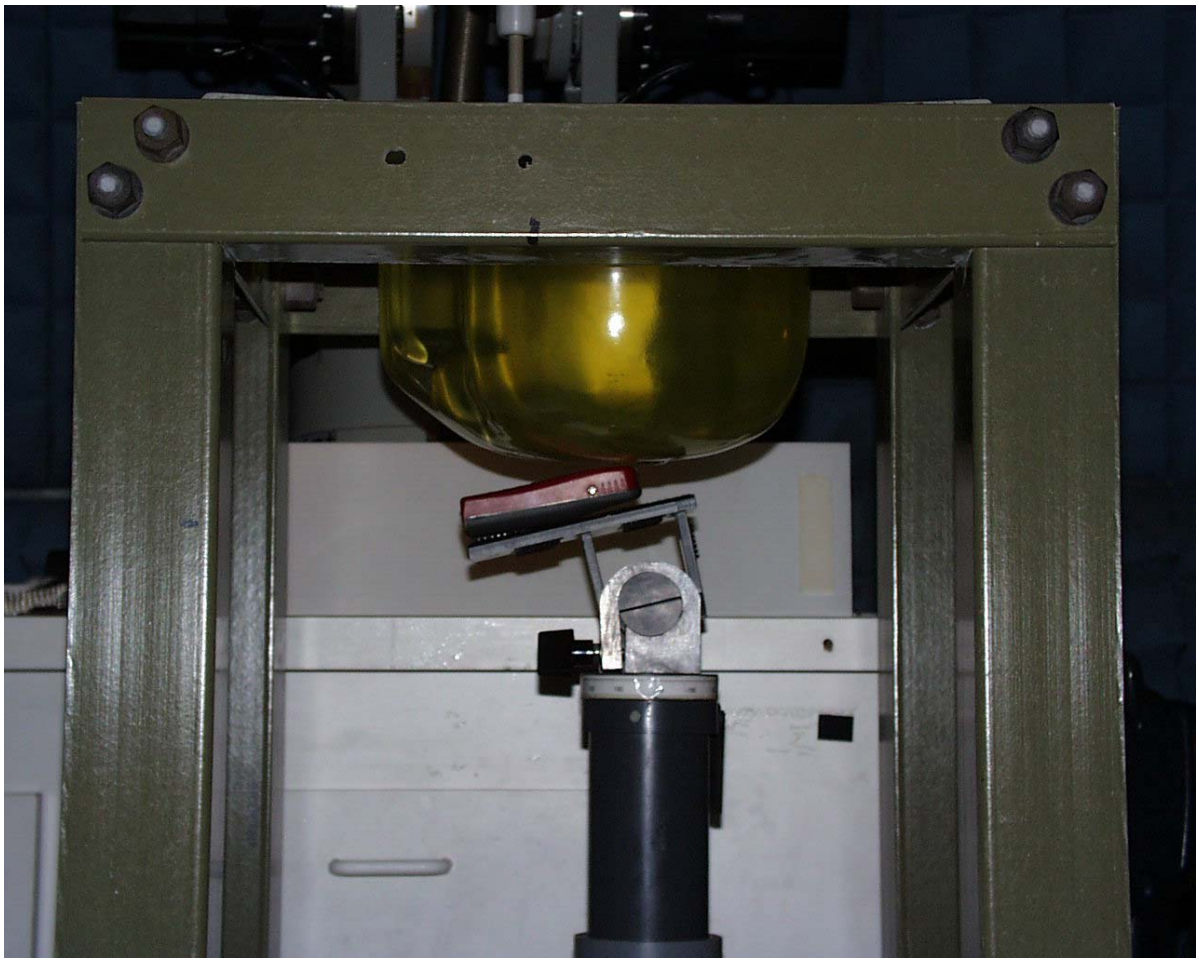
<Back View>

< EMI/RFI shielding spray had been applied to the inner side of the front case >

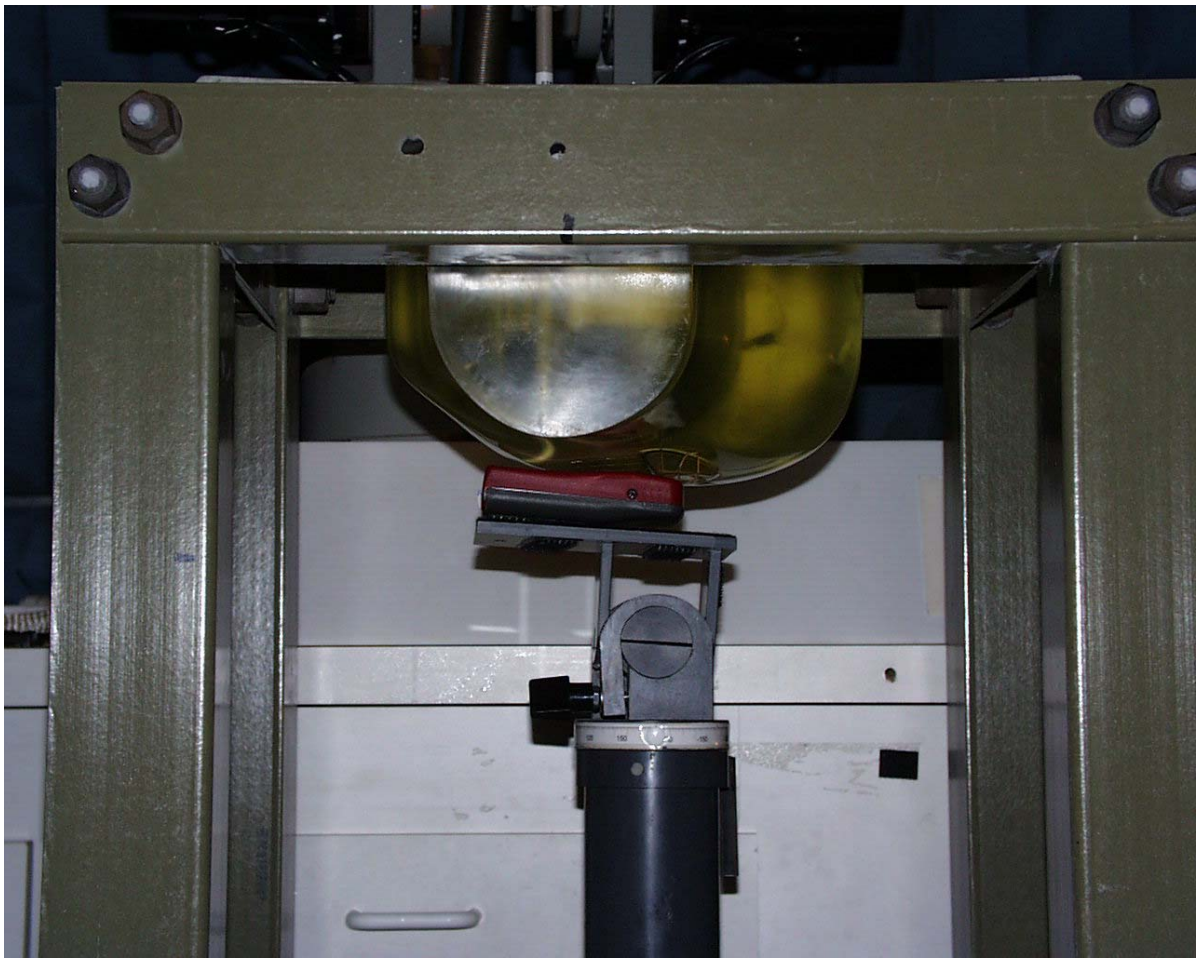
4.3. PHOTOGRAPHS OF EUT POSITION (HEAD LEFT/RIGHT EAR POSITION)



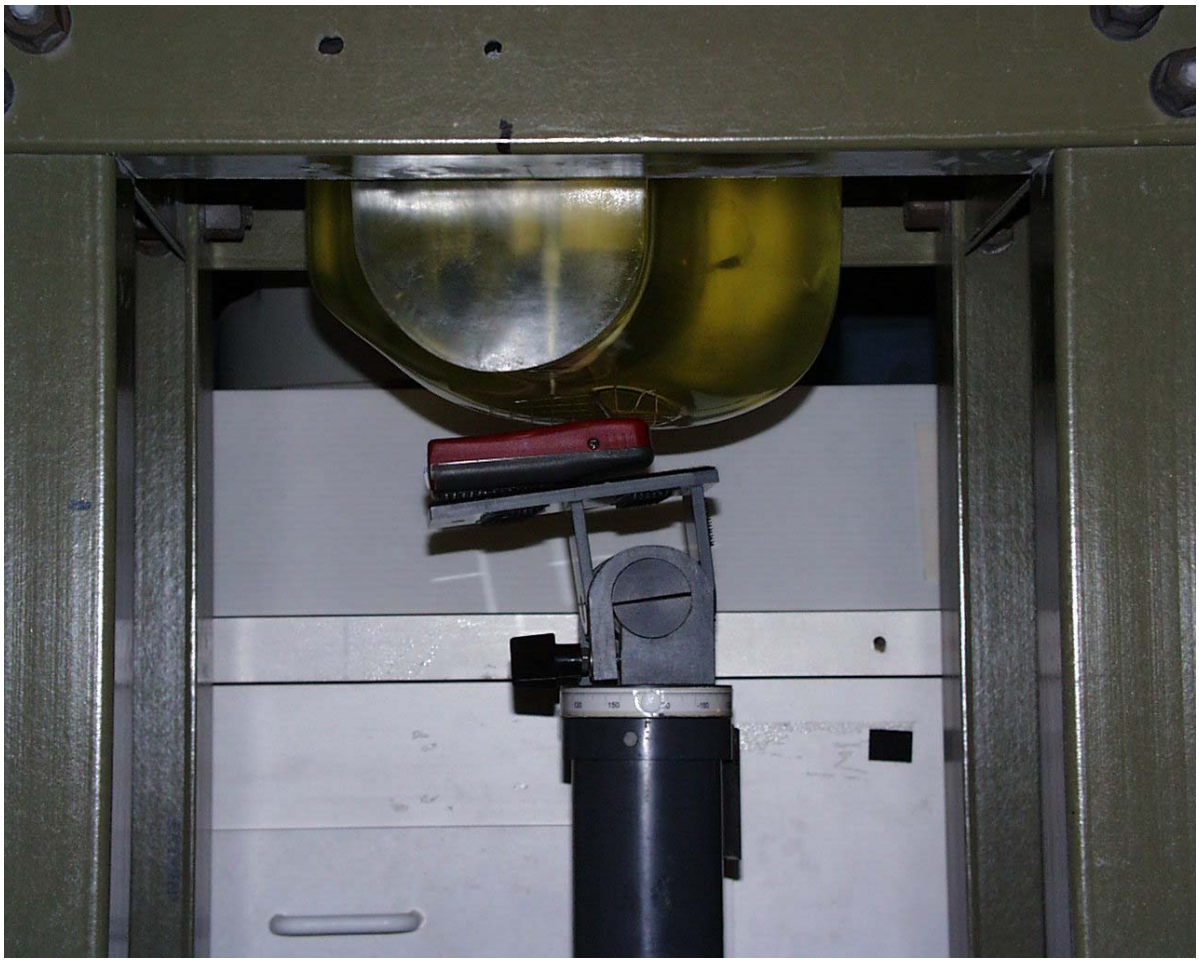
< Left Ear - Cheek position >



< Left ear – Tilt position >



< Right ear – Cheek position >

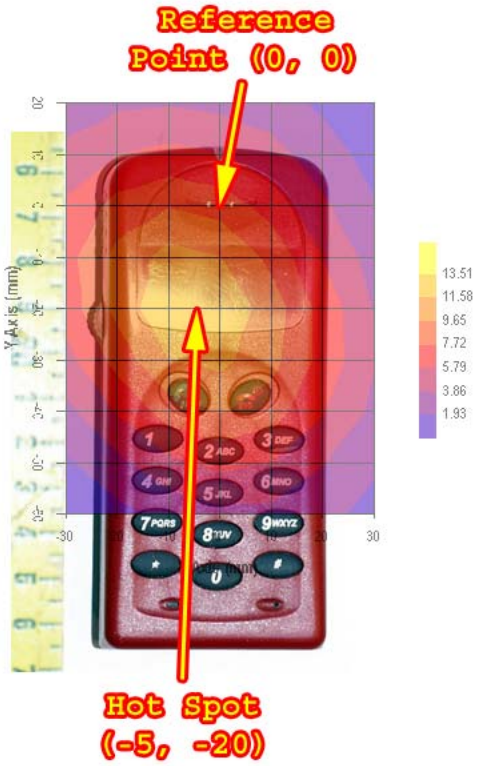


< Right ear – Tilt position >

4.4. MAXIMUM FIELD LOCATION

The maximum field was found to be located at (0, 80) with the test configuration as described below:

- **Head - Right ear configuration**
- **Cheek position**
- **849.0 MHz**



4.5. PEAK SPATIAL-AVERAGE SAR MEASURED

Phantom Configurations	Device Test Positions	Antenna Position	SAR (W/kg) Device Test Frequency		
			824.0 MHz @ 25.5 dBm	836.5 MHz @ 25.5 dBm	849.0 MHz @ 25.5 dBm
Head - Right Ear	**Cheek position**	**Internal**		**0.906**	**1.065**

4.6. SAR MEASUREMENT DATA*

4.6.1. Head – Left ear configuration Results

Device Test Positions	Antenna Position	SAR (W/kg) Device Test Frequency		
		824.0 MHz @ 25.5 dBm	836.5 MHz @ 25.5 dBm	849.0 MHz @ 25.5 dBm
Cheek position	Internal		0.783	
Tilt position	Internal		0.352	

4.6.2. Head – Right ear configuration Results

Device Test Positions	Antenna Position	SAR (W/kg) Device Test Frequency		
		824.0 MHz @ 25.5 dBm	836.5 MHz @ 25.5 dBm	849.0 MHz @ 25.5 dBm
Cheek position	**Internal**		**0.906**	**1.065**
Tilt position	Internal		0.600	

* OET65 supplement C (Edition 01-01) Page 40. – If the SAR measured at the middle channel for each test configuration is at least 2.0 dB lower than the SAR limit, testing at the high and low channel is optional for such test configuration(s).

EXHIBIT 5. SAR SYSTEM CONFIGURATION & TEST METHODOLOGY

5.1. MEASUREMENT SYSTEM SPECIFICATIONS

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

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.

5.4. SIMULATED TISSUE

Simulated Tissue: Suggested in a paper by George Hartsgrove 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 ρ = 1000 kg/m^3)

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 ^{o}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

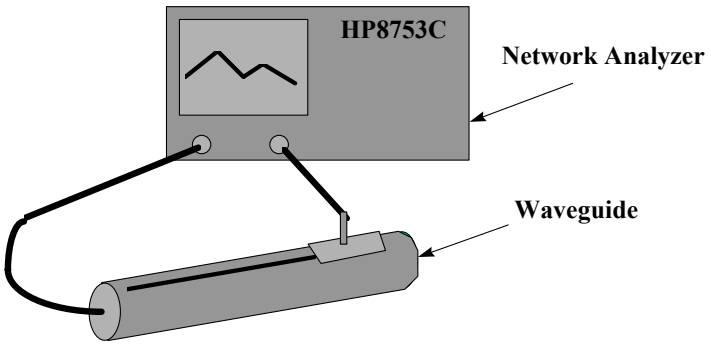
2) Slotted Coaxial Waveguide

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.

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.

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 1mW/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

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

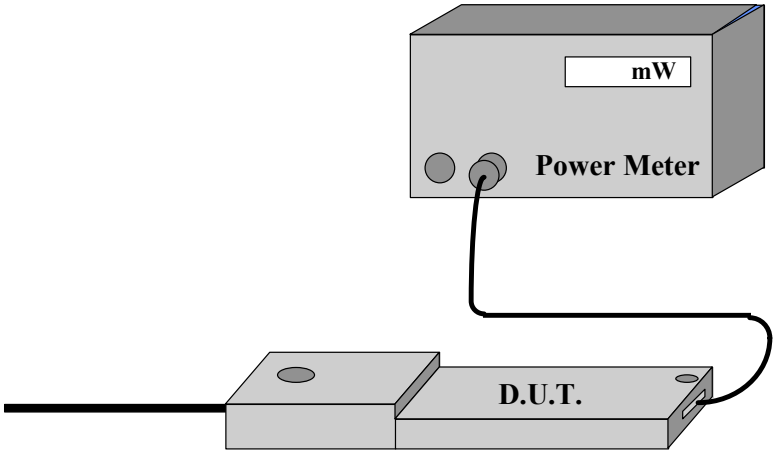
The voltage, (1 cm) above the phantoms surface (E_{tot} 1 cm), is needed to calculate the exposure over one gram of tissue. This SAR value that estimates the average over 1 gram of tissue, is obtained by taking the integral over 1 cm^2 surface of the measured field along the exponential decay curve of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

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

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

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 postioned 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.

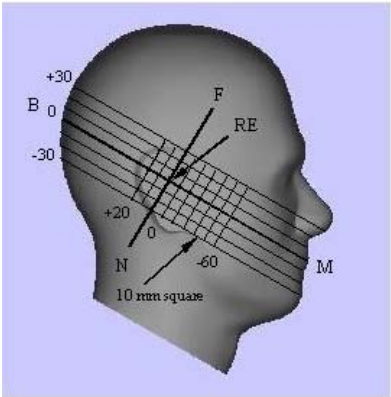


Figure 5.1 – Side view of the phantom showing relevant marking

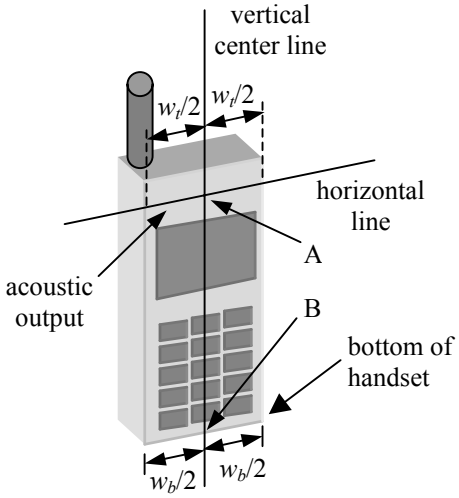


Figure 5.2a – Handset vertical and horizontal reference lines – fixed case

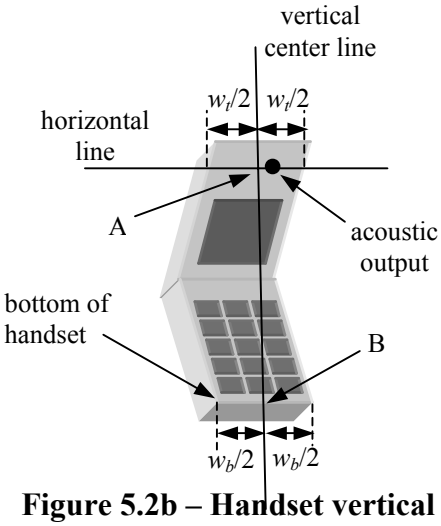


Figure 5.2b – Handset vertical and horizontal reference lines – "clam-shell"

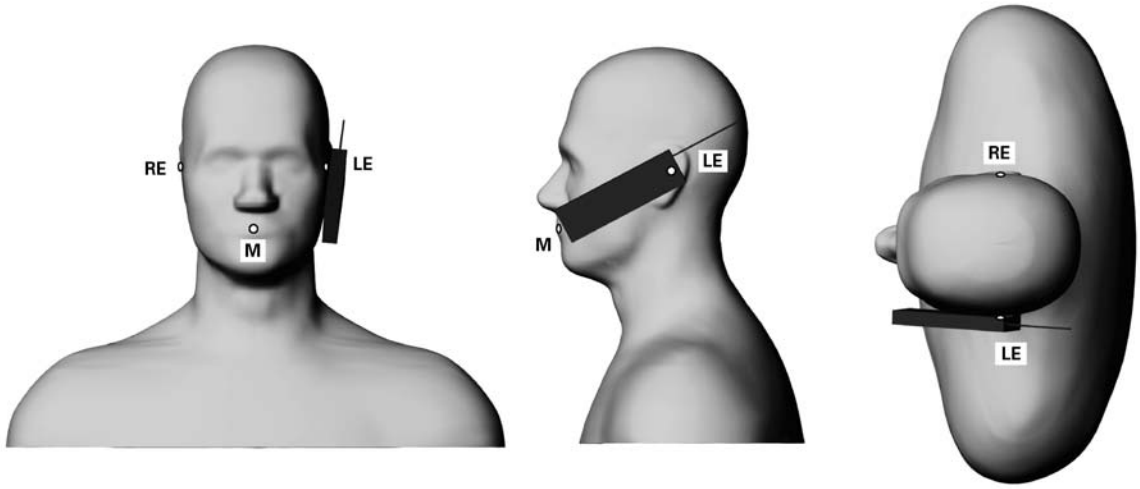


Figure 5.3 – Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only (also see Section 4).

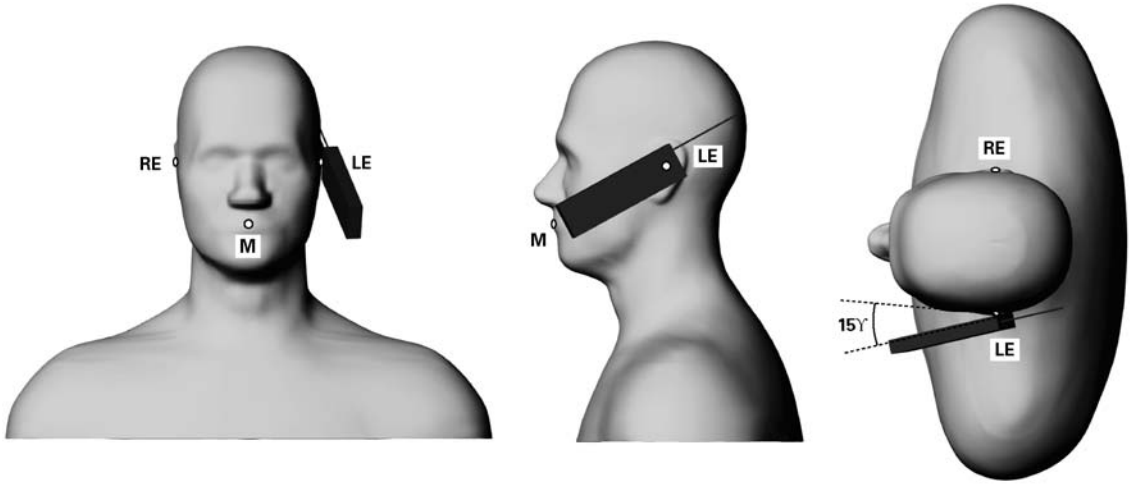


Figure 5.4 – Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only (also see Section 4).

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%

EXHIBIT 6. SAR PRESCANS / MODIFICATION

The EUT is not intended to be used in a body-worn configuration therefore the SAR evaluation with head left/right ear configuration was conducted for compliance.

EUT Configurations // Modification	Antenna Position	SAR (W/kg)
Head left ear – cheek position @ 836.5 MHz, 24.5 dBm // No modification	Internal	1.438
Head left ear – cheek position @ **849.0 MHz, 24.0 dBm** // No modification	Internal	1.650
Head left ear – **tilt** position @ 836.5 MHz, 24.5 MHz // No modification	Internal	0.384
Head **right** ear – cheek position @ 836.5 MHz, 24.5 dBm // No modification	Internal	1.395
Head right ear – cheek position @ 836.5 MHz, 24.5 dBm // **EMI/RFI shielding spray***	Internal	0.839
Head right ear – cheek position @ 836.5 MHz, **25.5 dBm** // EMI/RFI shielding spray	Internal	0.932

The original EUT was unable to comply with the FCC limit for general population category at certain channels even though the conducted output power level of EUT was adjusted down to 24.0 dBm. Therefore the modifications had been made in order to reduce the SAR.

A general purpose EMI/RFI shielding spray (conductive nickel coating) was applied to the inner side of the front case as a modification. This was found to reduce the SAR by 40 % approximately.

* "Super Shield Conductive Coating (CAT.NO. 841-340G)" manufactured by MG Chemicals (http://www.mgchemicals.com) was applied.

EXHIBIT 7. HEAD - LEFT/RIGHT EAR CONFIGURATION SAR MEASUREMENTS

7.1. HEAD – LEFT EAR CONFIGURATION RESULTS

Device Test Positions	Antenna Position	SAR (W/kg) Device Test Frequency		
		824.0 MHz @ 25.5 dBm	836.5 MHz @ 25.5 dBm	849.0 MHz @ 25.5 dBm
Cheek position	Internal		0.783	
Tilt position	Internal		0.352	

Test Information

Date : 27/02/2002
Time : 4:07:20 PM

Product	: Cellular Phone	**Test**	: SAR
Manufacturer	: New Horizons	**Frequency (MHz)**	: 836.5
Model Number	: 1100A	**Nominal Output Power (W)**	: 0.355
Serial Number	: RFQ2056	**Antenna Type**	: Patch
FCC ID Number	: P4F1100A	**Signal**	: CW

Phantom	: Head - Left Ear	**Dielectric Constant**	: 43.5
Simulated Tissue	: Brain	**Conductivity**	: 0.970

Probe	: UT-ETR-0200-1	**Antenna Position**	: Internal
Probe Offset (mm)	: 2.250	**Measured Power (W) (conducted)**	: 0.355
Sensor Factor (mV)	: 10.8		
Conversion Factor	: 0.974	**Pre Field Measurement(mV)**	: 8.6
Calibrated Date	: 21/12/2001	**Post Field Measurement(mV)**	: 8.3(-3.8%)

Amplifier Setting :

Channel 1 : 0.0052 Channel 2 : 0.0051 Channel 3 : 0.0064

Location of Maximum Field :

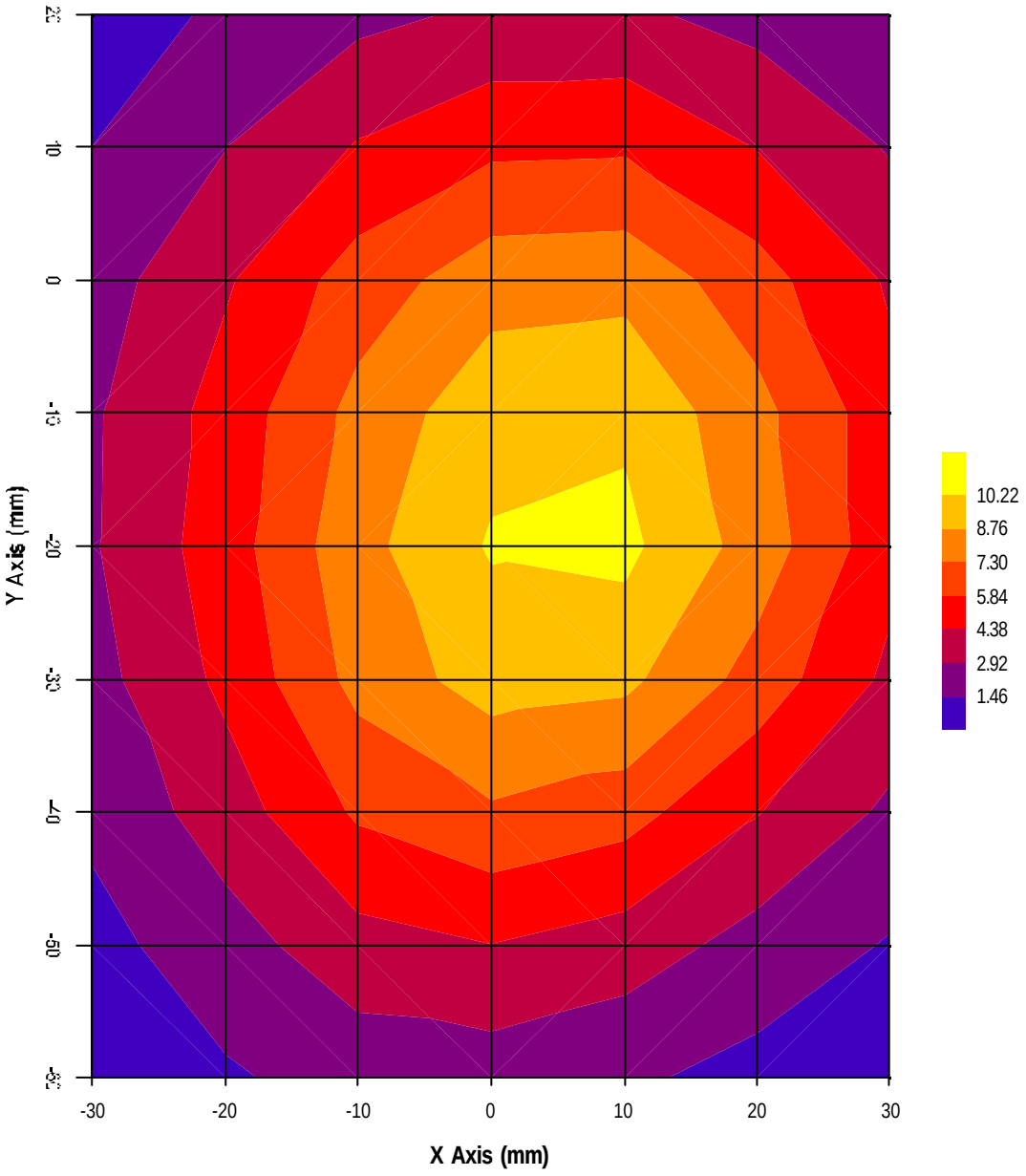
X = 10 Y = -20

Measured Values (mV) :

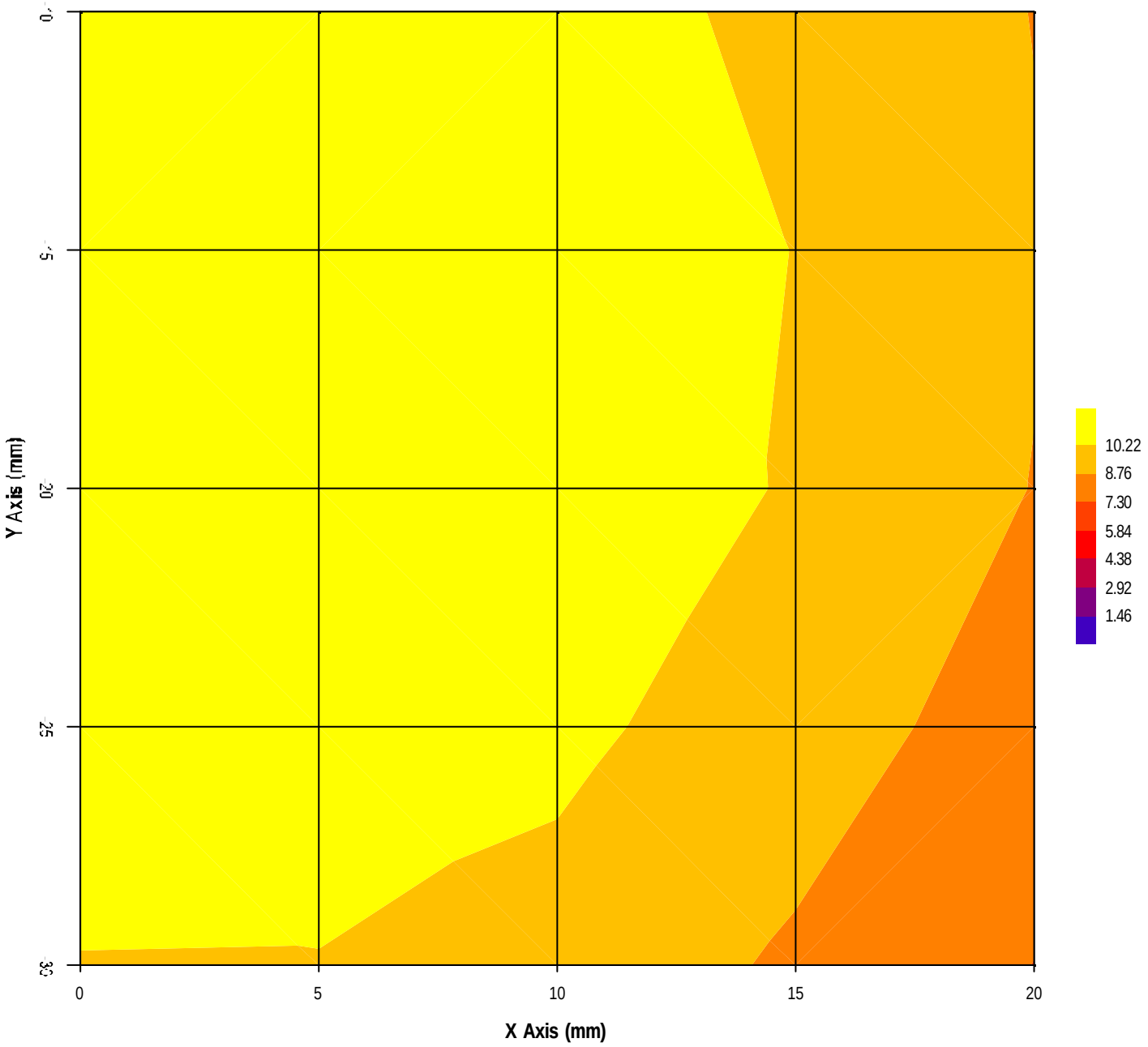
11.267	9.803	8.970	8.313	7.734	7.235
6.778	6.353	5.955	5.581	5.248	

Peak Voltage (mV) : 13.543 **1 Cm Voltage (mV)** : 6.198 **SAR (W/Kg)** : 0.783

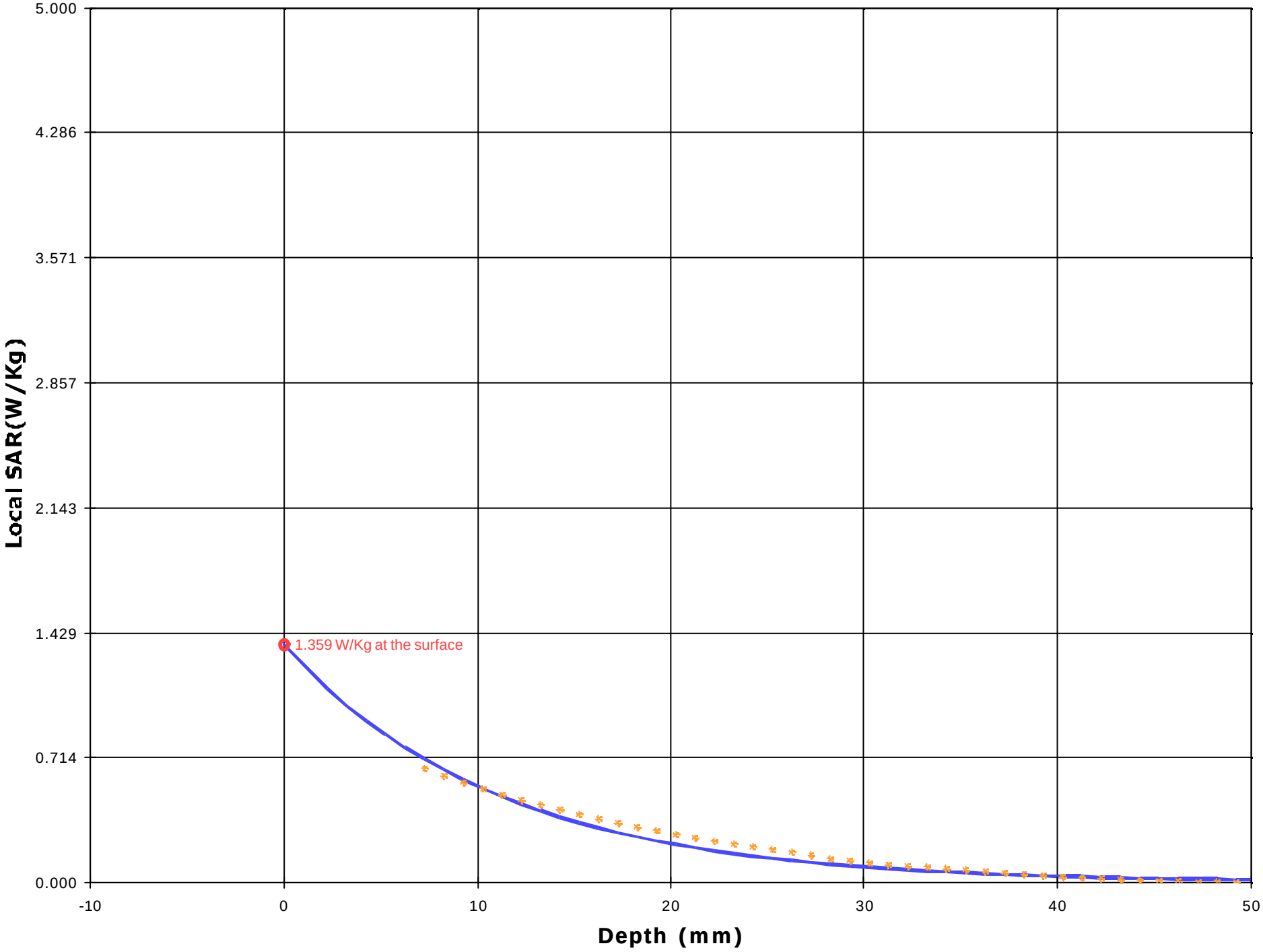
Left Head Cheek Position - 836.5MHz



Left Head Cheek Position - 836.5MHz



Left Head Cheek Position - 836.5MHz



Test Information

Date : 27/02/2002
Time : 4:24:26 PM

Product	: Cellular Phone	**Test**	: SAR
Manufacturer	: New Horizons	**Frequency (MHz)**	: 836.5
Model Number	: 1100A	**Nominal Output Power (W)**	: 0.355
Serial Number	: RFQ2056	**Antenna Type**	: Patch
FCC ID Number	: P4F1100A	**Signal**	: CW

Phantom	: Head - Left Ear	**Dielectric Constant**	: 43.5
Simulated Tissue	: Brain	**Conductivity**	: 0.970

Probe	: UT-ETR-0200-1	**Antenna Position**	: Internal
Probe Offset (mm)	: 2.250	**Measured Power (W) (conducted)**	: 0.355
Sensor Factor (mV)	: 10.8		
Conversion Factor	: 0.974	**Pre Field Measurement(mV)**	: 5.4
Calibrated Date	: 21/12/2001	**Post Field Measurement(mV)**	: 5.2(-4.8%)

Amplifier Setting :

Channel 1 : 0.0052 Channel 2 : 0.0051 Channel 3 : 0.0064

Location of Maximum Field :

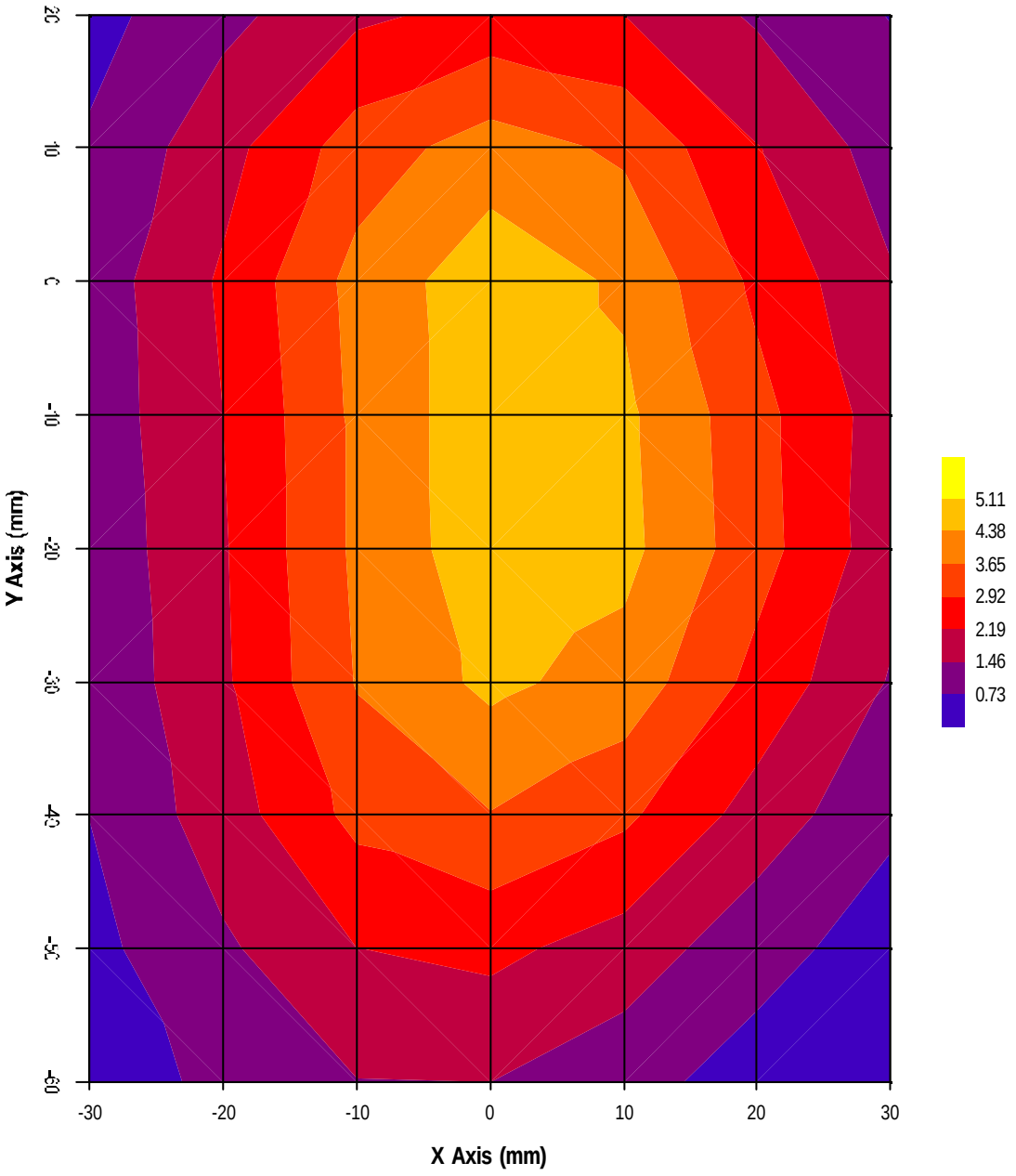
X = 5 Y = 5

Measured Values (mV) :

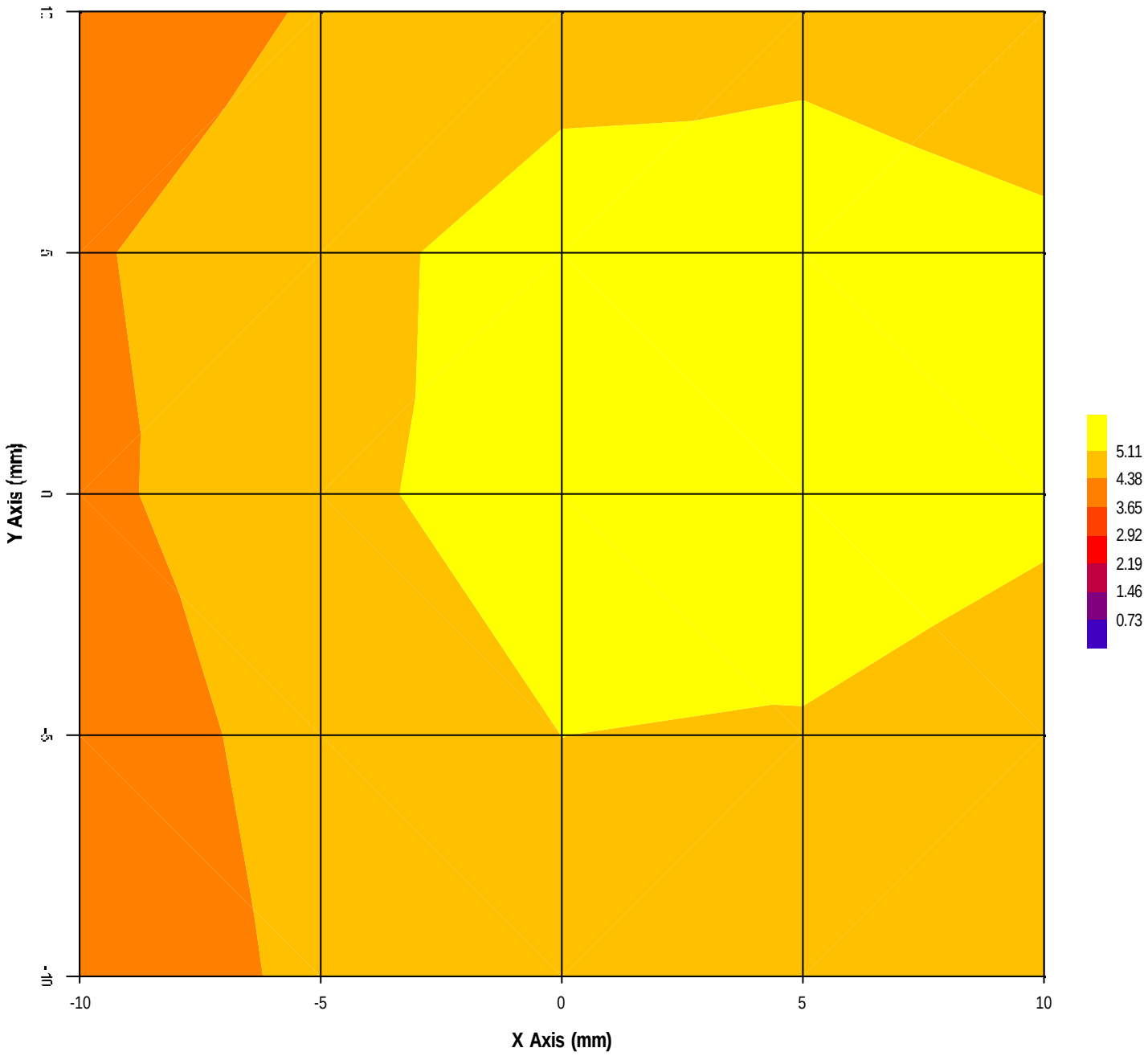
5.370	4.475	3.958	3.622	3.293	2.995
2.732	2.490	2.267	2.092	1.902	

Peak Voltage (mV) : 6.946 **1 Cm Voltage (mV)** : 2.282 **SAR (W/Kg)** : 0.352

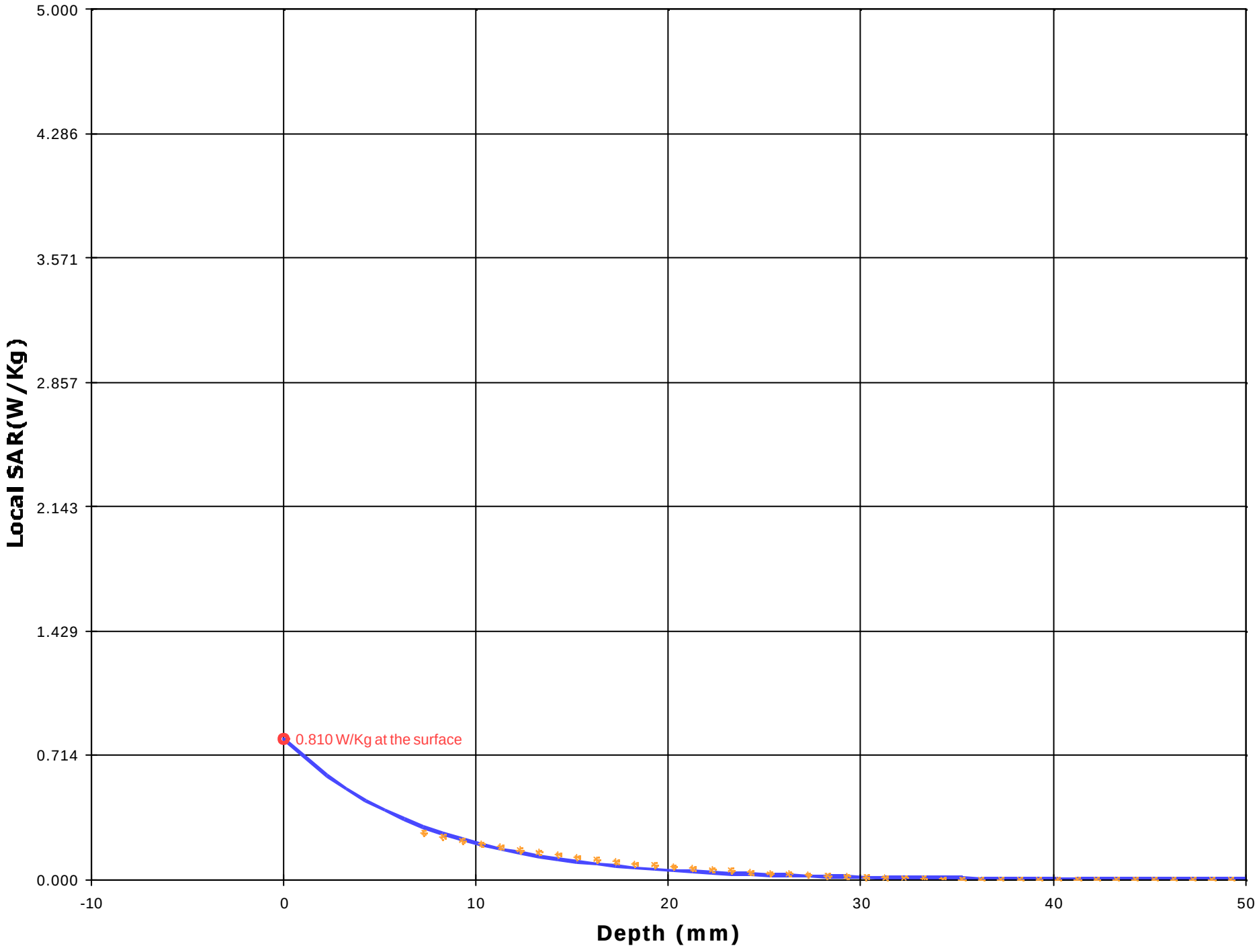
Left Head Tilt Position - 836.5MHz



Left Head Tilt Position - 836.5MHz



Left Head Tilt Position - 836.5MHz



7.2. HEAD – RIGHT EAR CONFIGURATION RESULTS

Device Test Positions	Antenna Position	SAR (W/kg) Device Test Frequency		
		824.0 MHz @ 25.5 dBm	836.5 MHz @ 25.5 dBm	849.0 MHz @ 25.5 dBm
Cheek position	**Internal**		**0.906**	**1.065**
Tilt position	Internal		0.600	

Test Information

Date : 27/02/2002
Time : 3:26:24 PM

Product	: Cellular Phone	**Test**	: SAR
Manufacturer	: New Horizons	**Frequency (MHz)**	: 836.5
Model Number	: 1100A	**Nominal Output Power (W)**	: 0.355
Serial Number	: RFQ2056	**Antenna Type**	: Patch
FCC ID Number	: P4F1100A	**Signal**	: CW

Phantom	: Head - Right Ear	**Dielectric Constant**	: 43.5
Simulated Tissue	: Brain	**Conductivity**	: 0.970

Probe	: UT-ETR-0200-1	**Antenna Position**	: Internal
Probe Offset (mm)	: 2.250	**Measured Power (W) (conducted)**	: 0.355
Sensor Factor (mV)	: 10.8		
Conversion Factor	: 0.974	**Pre Field Measurement(mV)**	: 6.6
Calibrated Date	: 21/12/2001	**Post Field Measurement(mV)**	: 6.3(-3.9%)

Amplifier Setting :

Channel 1 : 0.0052 Channel 2 : 0.0051 Channel 3 : 0.0064

Location of Maximum Field :

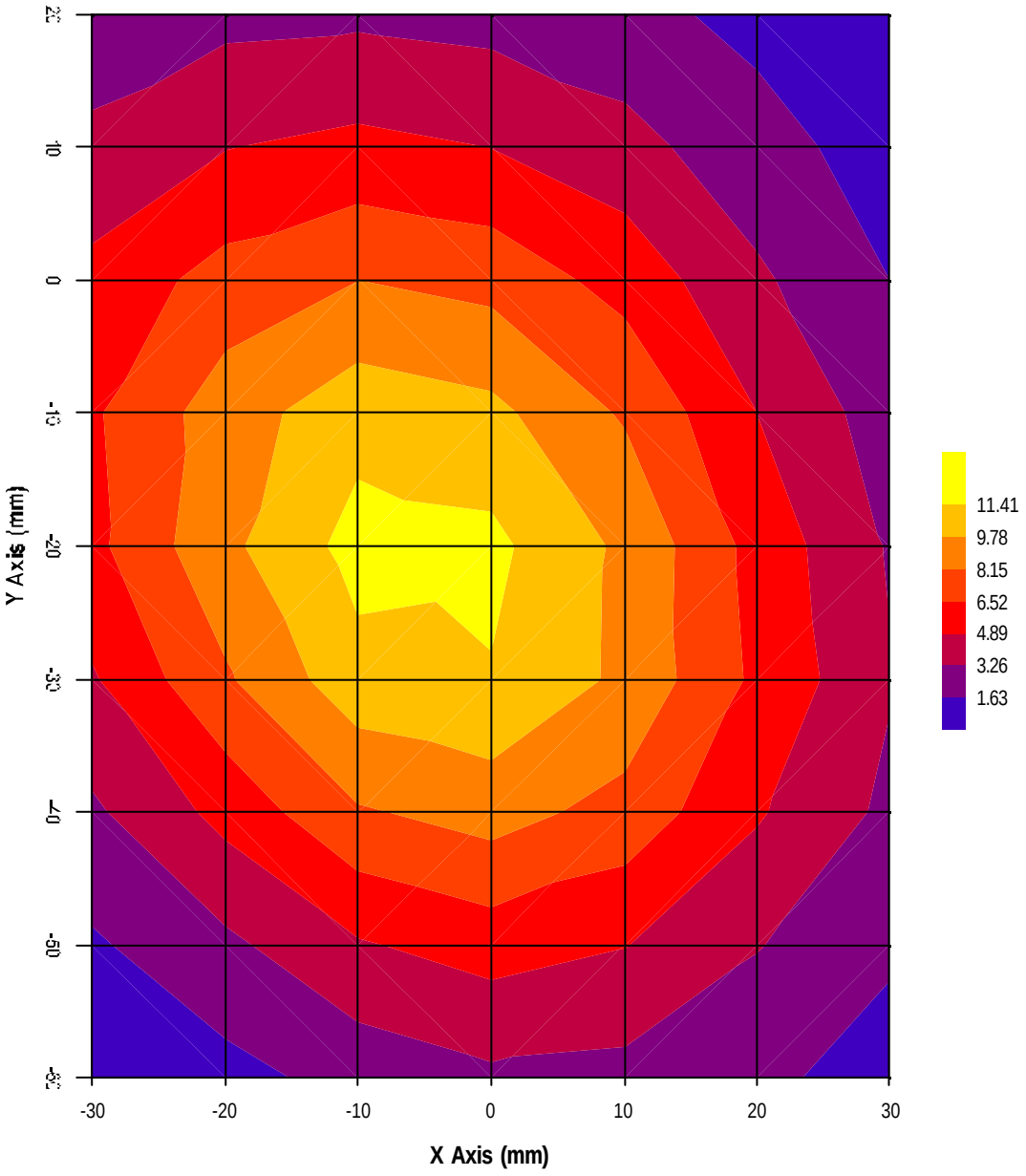
X = -5 Y = -20

Measured Values (mV) :

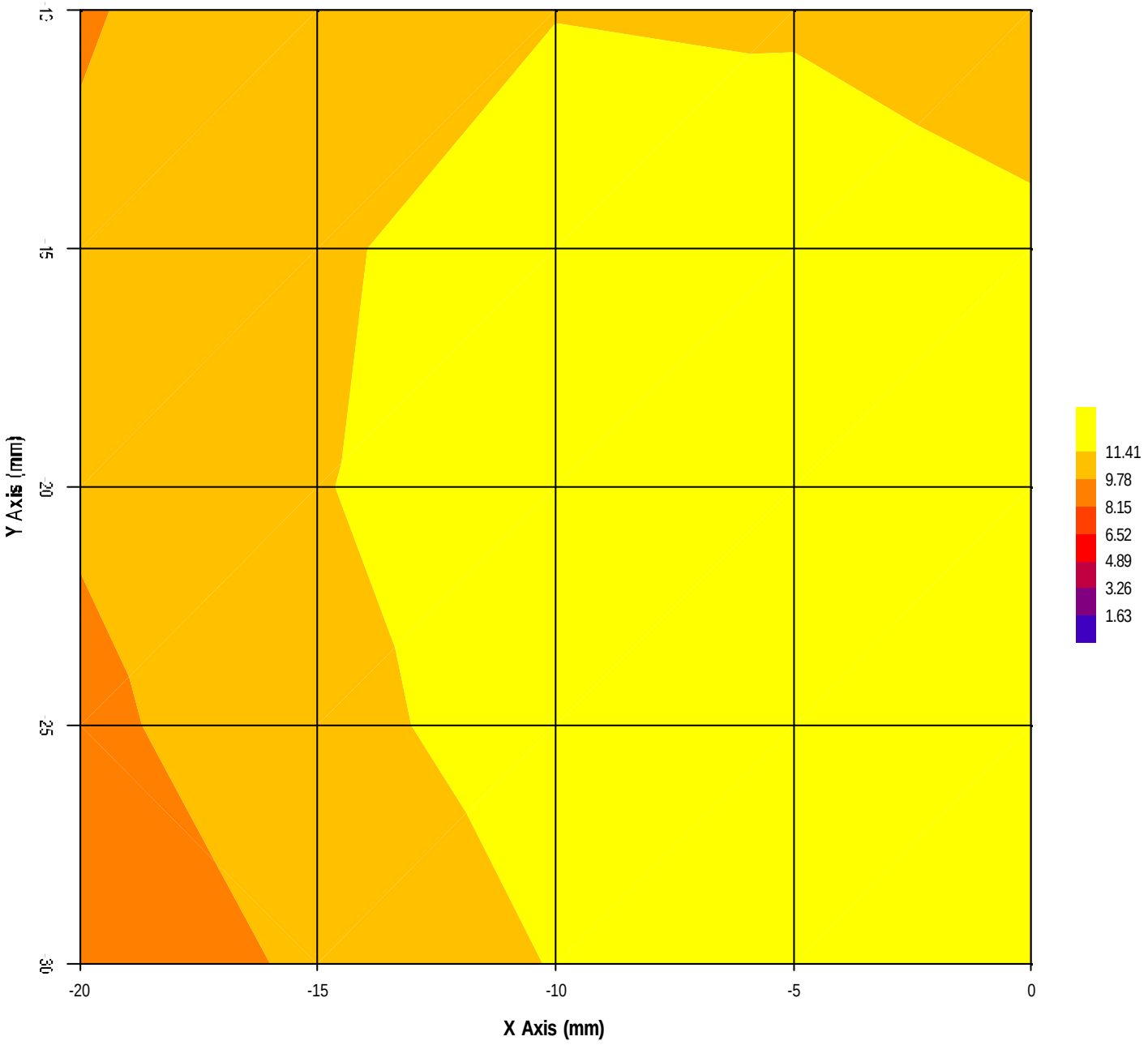
12.949	11.141	10.159	9.446	8.838	8.248
7.735	7.188	6.728	6.230	5.691	

Peak Voltage (mV) : 15.719 **1 Cm Voltage (mV)** : 6.823 **SAR (W/Kg)** : 0.906

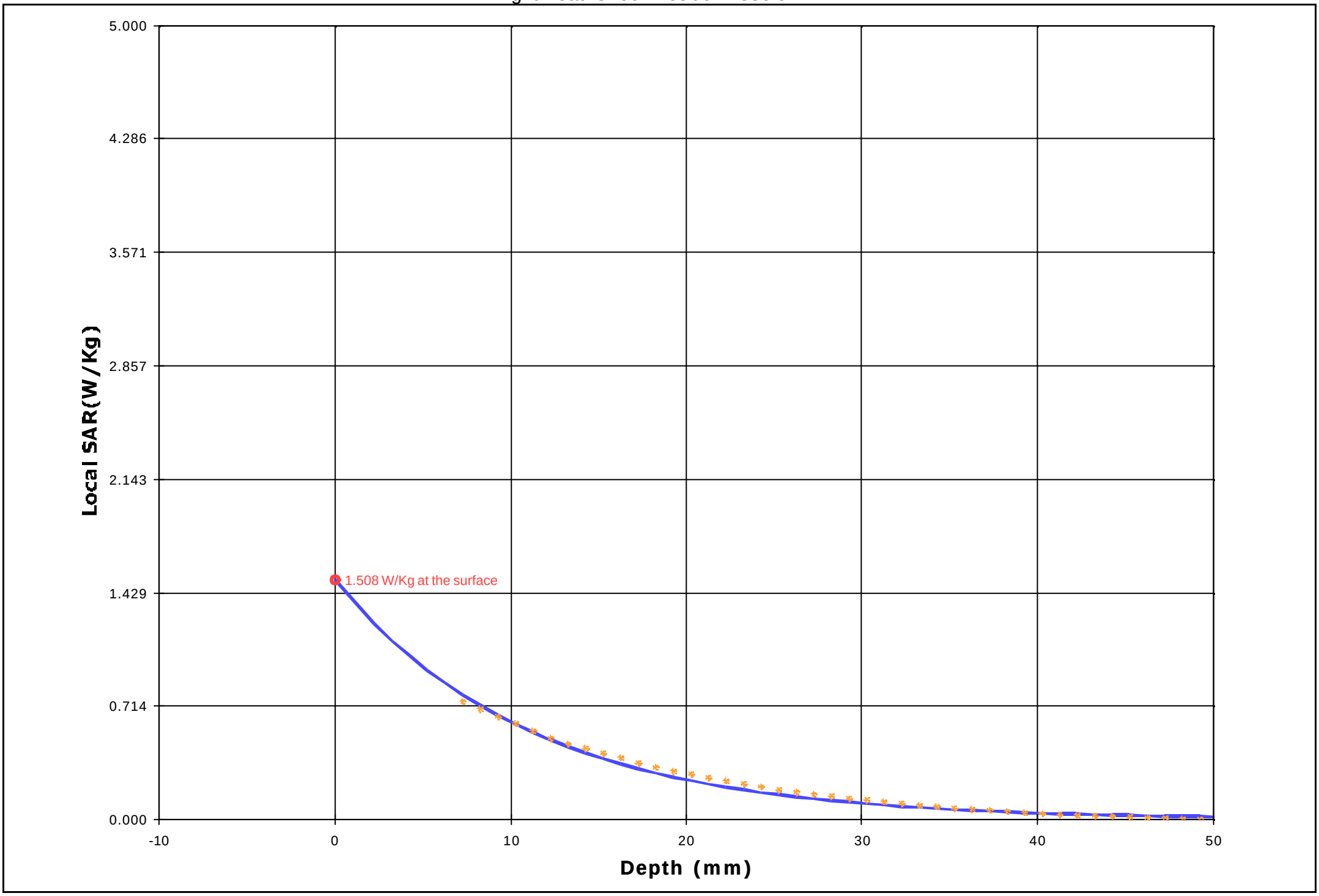
Right Head Cheek Position - 836.5MHz



Right Head Cheek Position - 836.5MHz



Right Head Cheek Position - 836.5MHz



Test Information

Date : 27/02/2002
Time : 3:39:23 PM

Product	: Cellular Phone	**Test**	: SAR
Manufacturer	: New Horizons	**Frequency (MHz)**	: 849.0
Model Number	: 1100A	**Nominal Output Power (W)**	: 0.355
Serial Number	: RFQ2056	**Antenna Type**	: Patch
FCC ID Number	: P4F1100A	**Signal**	: CW

Phantom	: Head - Right Ear	**Dielectric Constant**	: 43.5
Simulated Tissue	: Brain	**Conductivity**	: 0.970

Probe	: UT-ETR-0200-1	**Antenna Position**	: Internal
Probe Offset (mm)	: 2.250	**Measured Power (W) (conducted)**	: 0.355
Sensor Factor (mV)	: 10.8		
Conversion Factor	: 0.974	**Pre Field Measurement(mV)**	: 9.0
Calibrated Date	: 21/12/2001	**Post Field Measurement(mV)**	: 8.6(-4.4%)

Amplifier Setting :

Channel 1 : 0.0052 Channel 2 : 0.0051 Channel 3 : 0.0064

Location of Maximum Field :

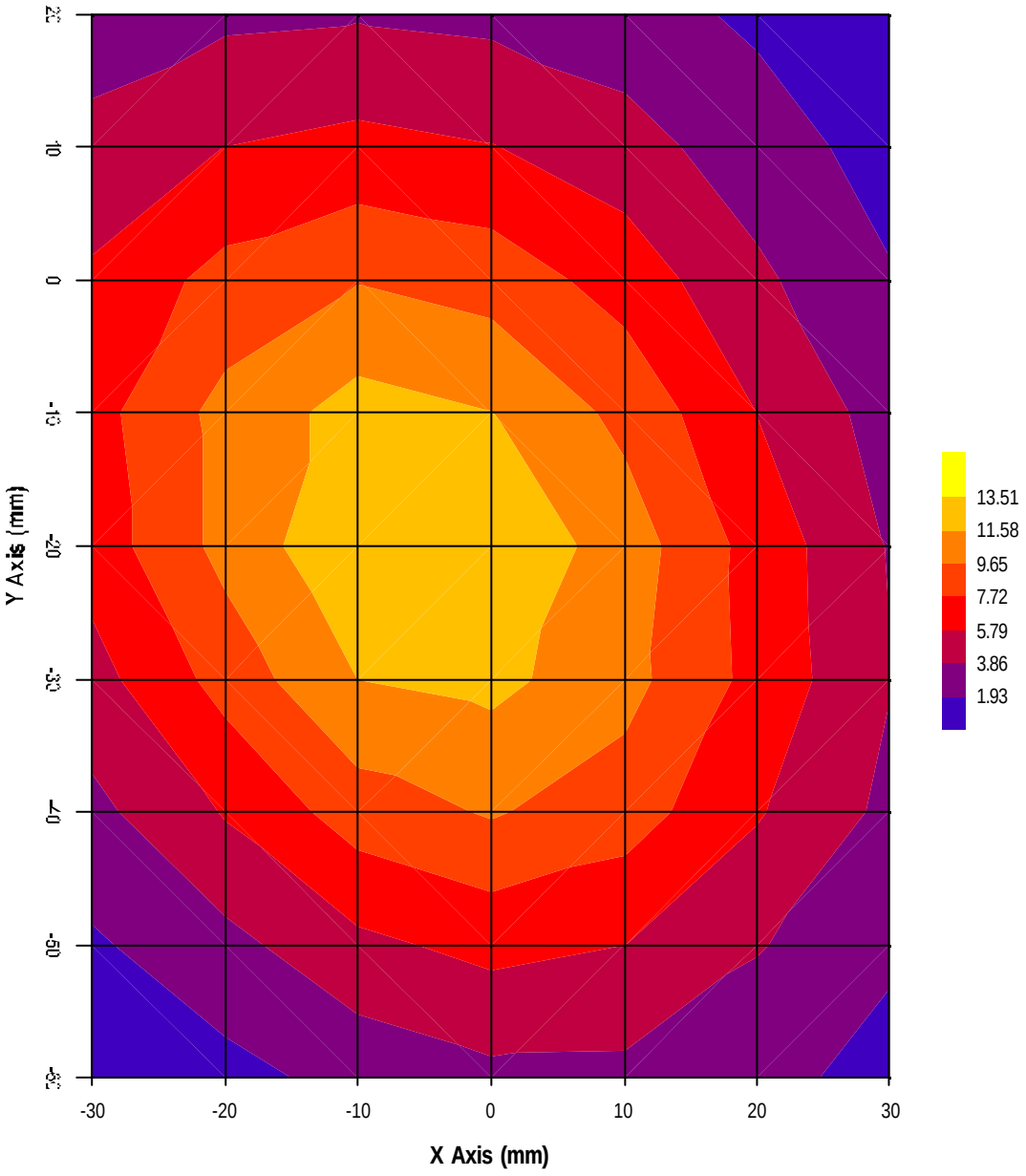
X = -5 Y = -20

Measured Values (mV) :

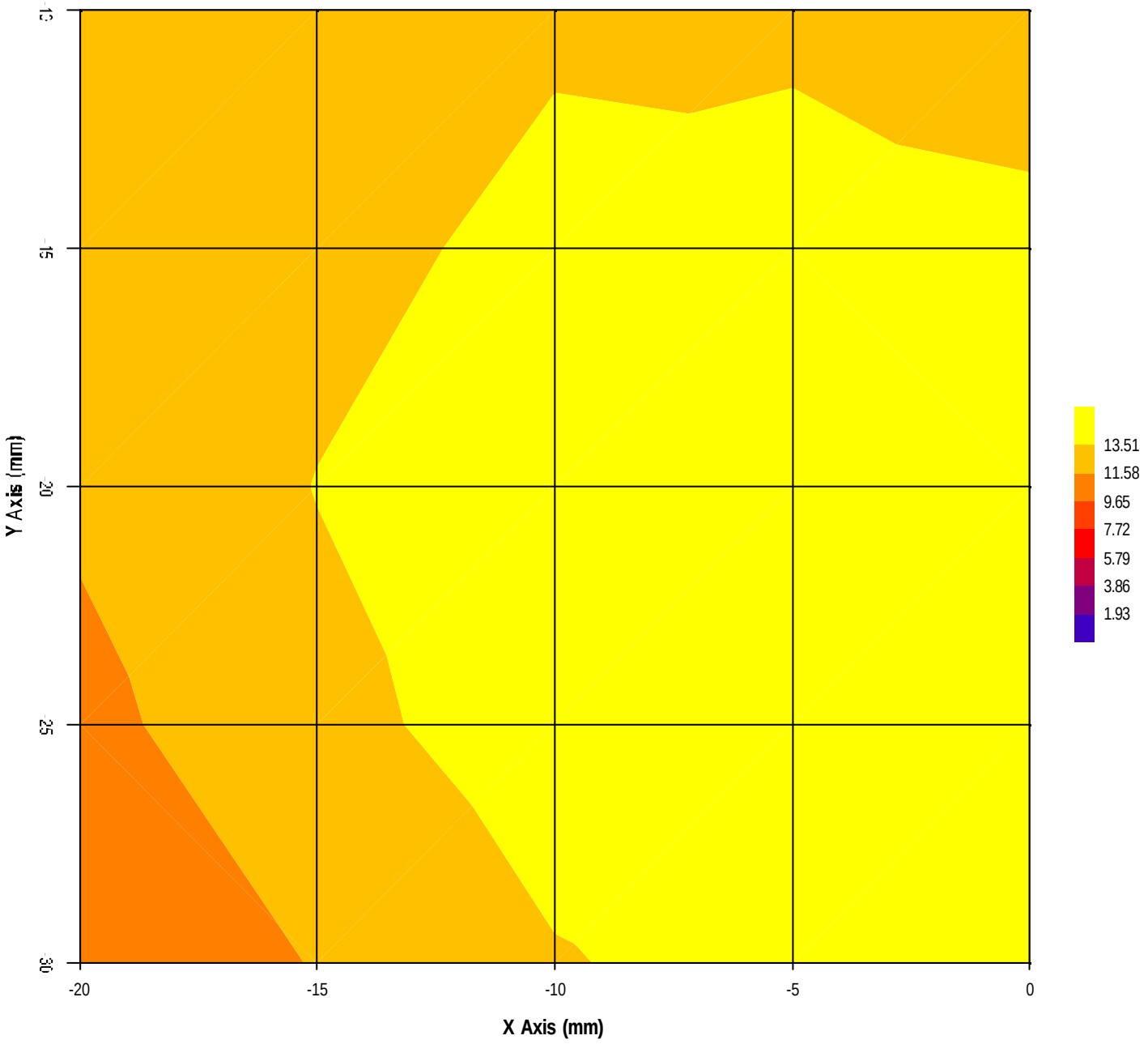
15.031	12.913	11.521	10.960	10.211	9.559
8.930	8.417	7.836	7.310	6.784	

Peak Voltage (mV) : 18.202 **1 Cm Voltage (mV)** : 8.029 **SAR (W/Kg)** : 1.065

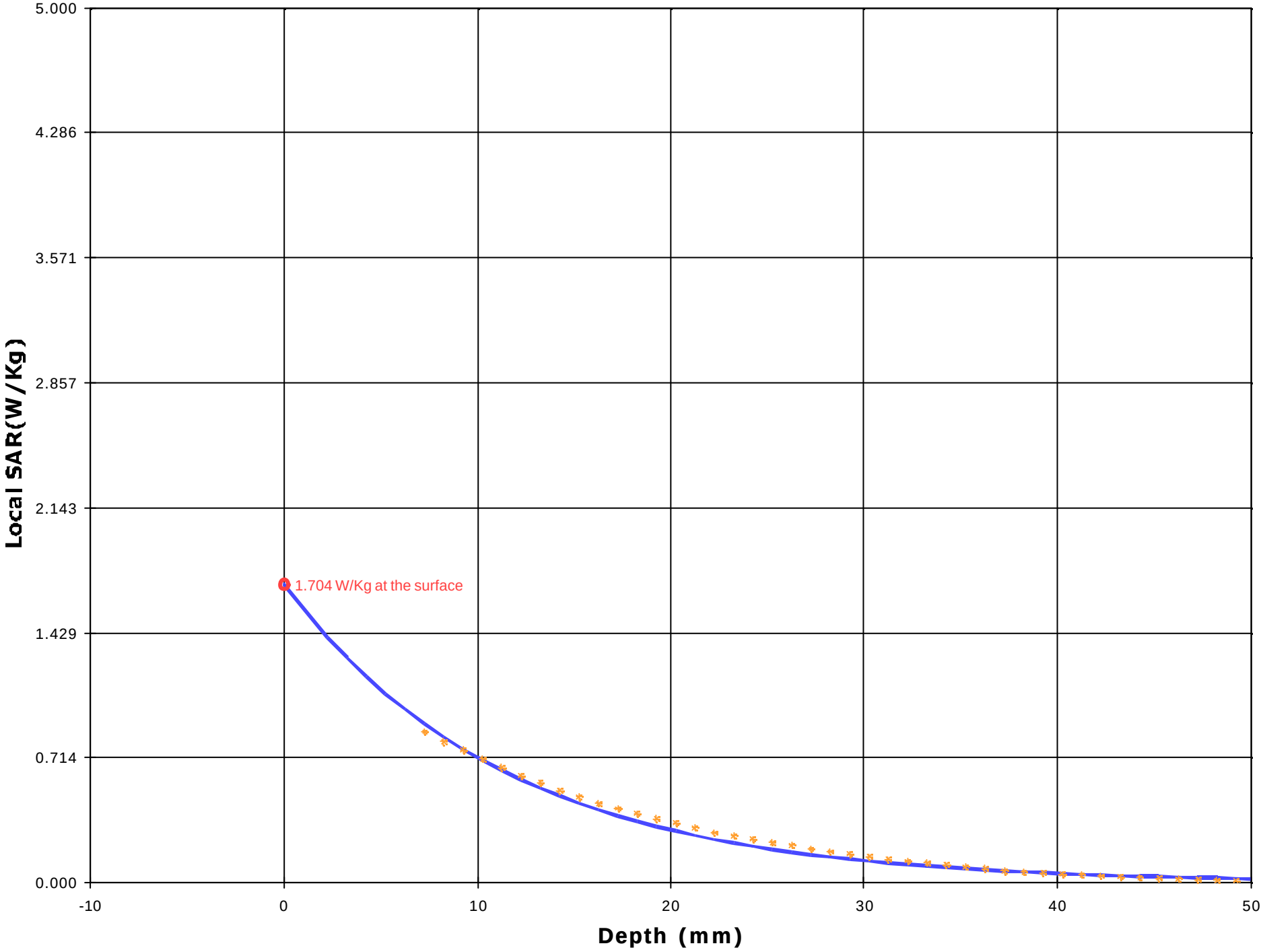
Right Head Cheek Position - 849.0MHz



Right Head Cheek Position - 849.0MHz



Right Head Cheek Position - 849.0MHz



Test Information

Date : 27/02/2002
Time : 3:09:58 PM

Product	: Cellular Phone	**Test**	: SAR
Manufacturer	: New Horizons	**Frequency (MHz)**	: 836.5
Model Number	: 1100A	**Nominal Output Power (W)**	: 0.355
Serial Number	: RFQ2056	**Antenna Type**	: Patch
FCC ID Number	: P4F1100A	**Signal**	: CW

Phantom	: Head - Right Ear	**Dielectric Constant**	: 43.5
Simulated Tissue	: Brain	**Conductivity**	: 0.970

Probe	: UT-ETR-0200-1	**Antenna Position**	: Internal
Probe Offset (mm)	: 2.250	**Measured Power (W) (conducted)**	: 0.355
Sensor Factor (mV)	: 10.8		
Conversion Factor	: 0.974	**Pre Field Measurement(mV)**	: 7.9
Calibrated Date	: 21/12/2001	**Post Field Measurement(mV)**	: 7.6(-3.9%)

Amplifier Setting :

Channel 1 : 0.0052 Channel 2 : 0.0051 Channel 3 : 0.0064

Location of Maximum Field :

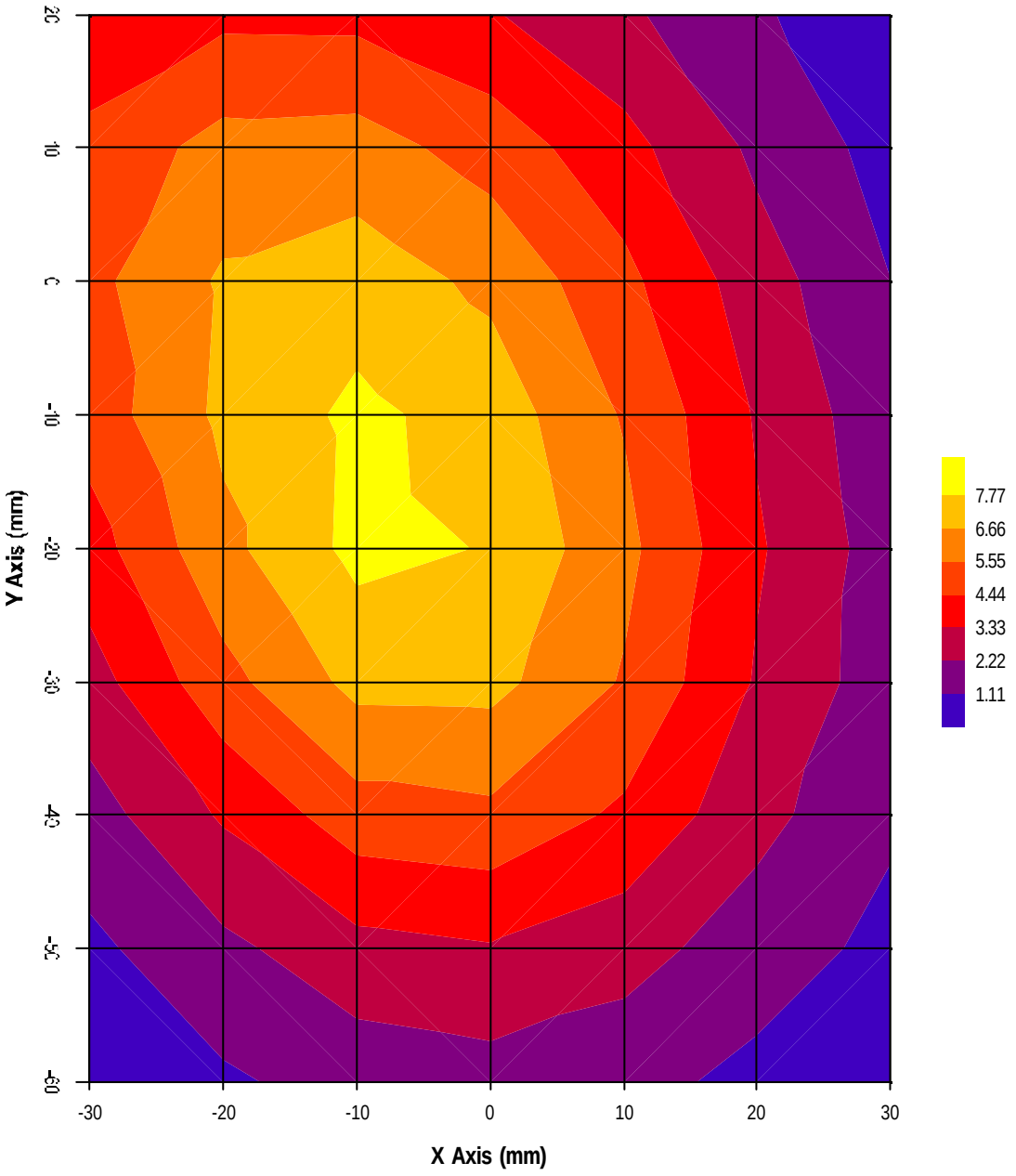
X = -10 Y = -15

Measured Values (mV) :

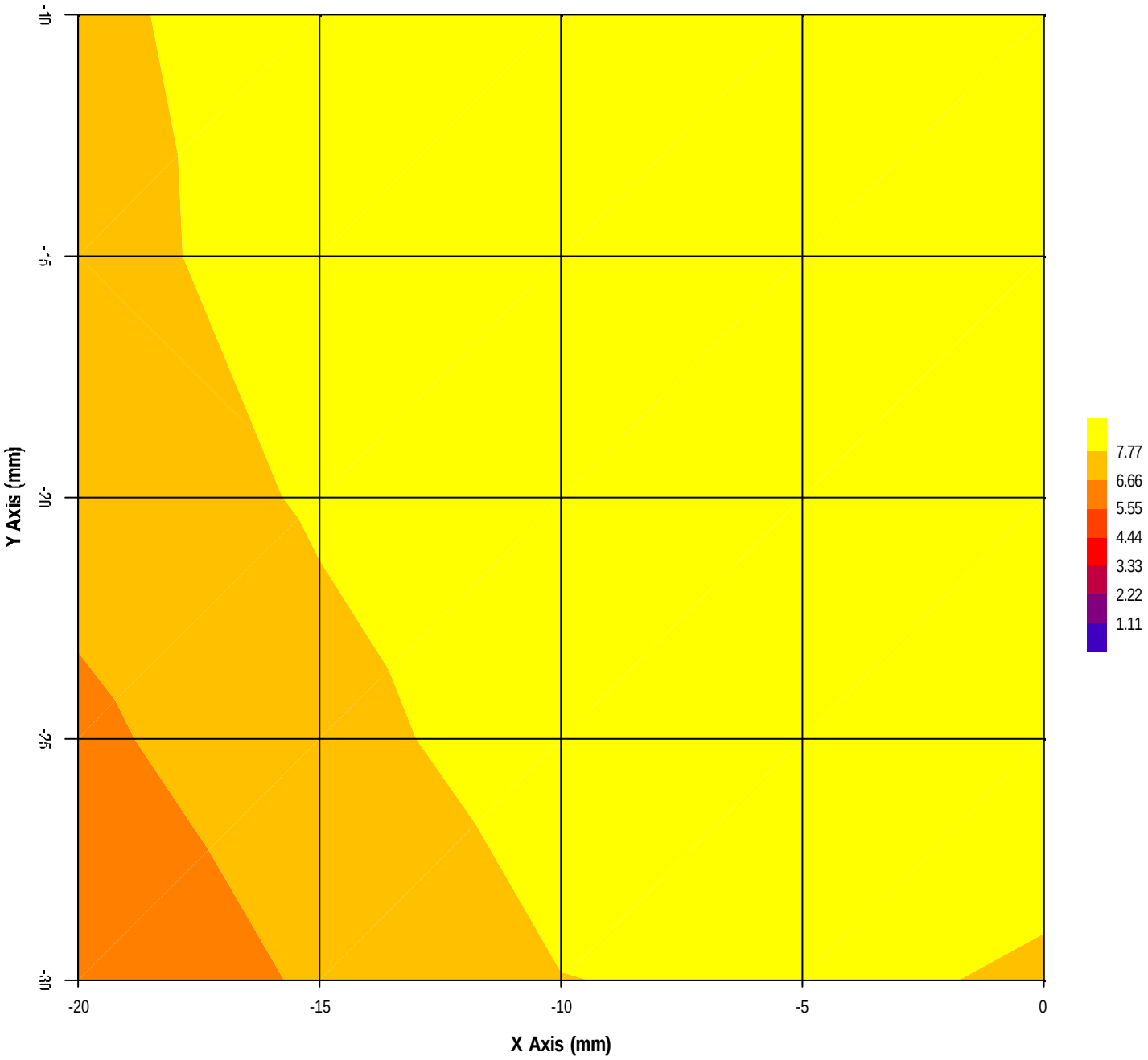
8.914	7.625	6.932	6.320	5.891	5.516
5.218	4.760	4.449	4.108	3.827	

Peak Voltage (mV) : 10.919 **1 Cm Voltage (mV)** : 4.622 **SAR (W/Kg)** : 0.600

Right Head Tilt Position - 836.5MHz



Right Head Tilt Position - 836.5MHz



Right Head Tilt Position - 836.5MHz

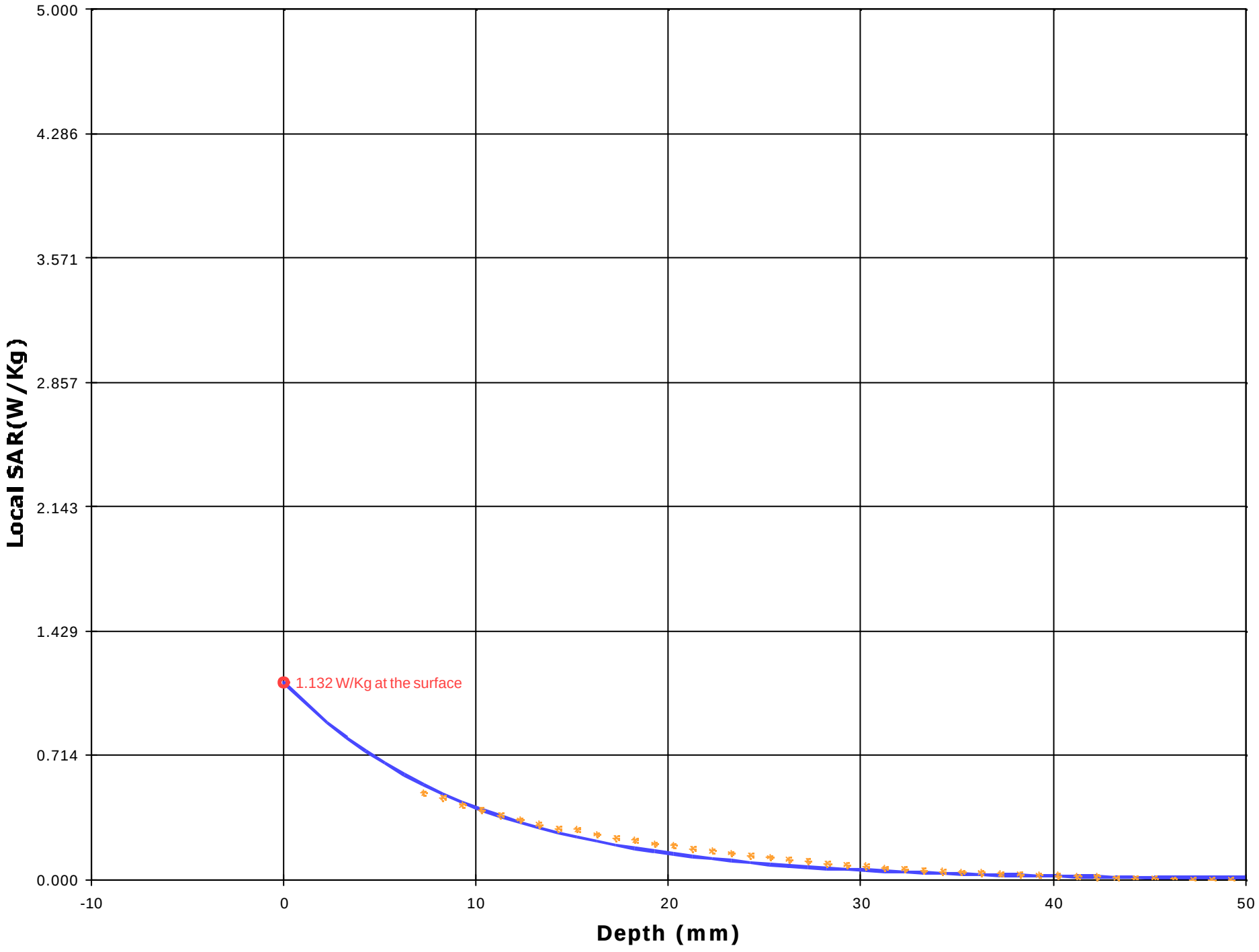


EXHIBIT 8. TISSUE CALIBRATION

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

The solution was initially calibrated using the slotted coaxial waveguide at 12/18/2001. The dielectric parameters of the solution was verified again using HP 85070C dielectric probe kit as shown below at 02/26/2002.

Calibration Kit	f (MHz)	Tissue Temperature (°C)	ε′	ε″	σ (S/m)
HP 85070C Dielectric Probe Kit	835	21.5	**43.5**	20.881	**0.97**

Ultratech Group of Labs.
3000 Bristol Circle Road
Oakville, Ontario
Canada L6H 6G4

Phone (905) 829-1570
FAX (905) 829-8050
Email vhk.ultratech@sympatico.ca

Name: Jay

Date: 12/18/2001

Frequency: 835 MHz

Mixture: Brain

Room Temp.: 22.5 ±1°C

# of Points: 11

Point Dist: 1.0 cm

Point	Amplitude	Phase
1	-22.54	103.36
2	-24.94	34.98
3	-27.11	-33.27
4	-29.36	-100.21
5	-31.61	-168.30
6	-33.82	123.63
7	-36.14	55.10
8	-38.48	-12.41
9	-40.72	-79.70
10	-43.09	-147.84
11	-45.58	144.81

Composition

		weight	% by weight
	DI Water	28,497.0 g	41.79 %
Sucrose (98 %) ←	Sugar	38,500.0 g	56.46 %
2-(2-ButoxyEthoxy) Ethanol ←	Alcohol	0.0 g	0.00 %
Sodium Chloride (99+ %) ←	Salt	997.0 g	1.46 %
Hydroxyethyl Cellulose ←	HEC	100.0 g	0.15 %
	Bactericide	100.0 g	0.15 %
	1,2-propanediol	0.0 g	0.00 %
		0.0 g	0.00 %
		0.0 g	0.00 %
	Total	68,194.0 g	100.00 %

Mass Den. 1298.5
Heat Cap. 2.9

ω(rad/sec)	5.246E+09
ε_0(F/m)	8.854E-12
μ(H/m)	1.257E-06
α_{avg}(Np/cm)	-0.26314
β_{avg}(rad/cm)	-1.18432

Results:		Target	Low Limit	High Limit	% Off Target
D. Const:	43.54	41.50	39.425	43.575	4.91
Conductivity:	0.95	0.90	0.855	0.945	5.05

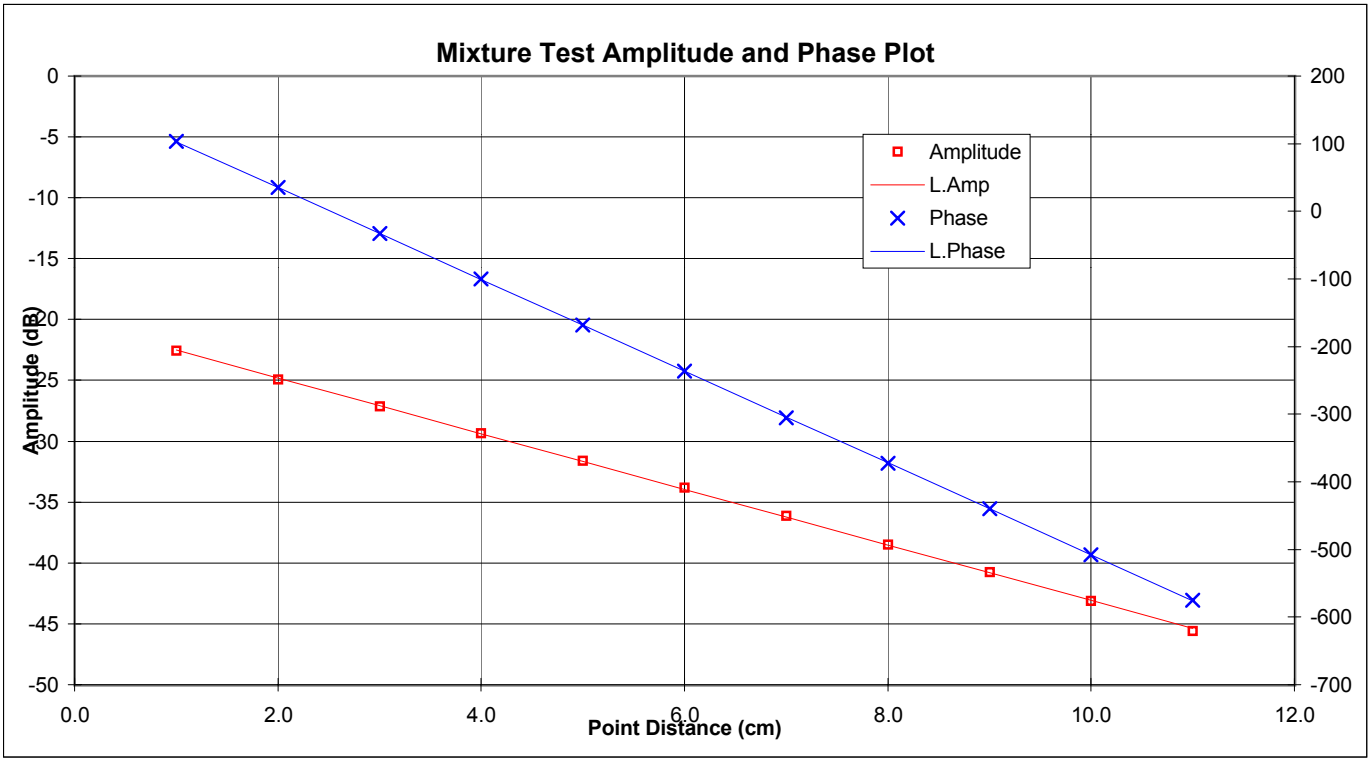
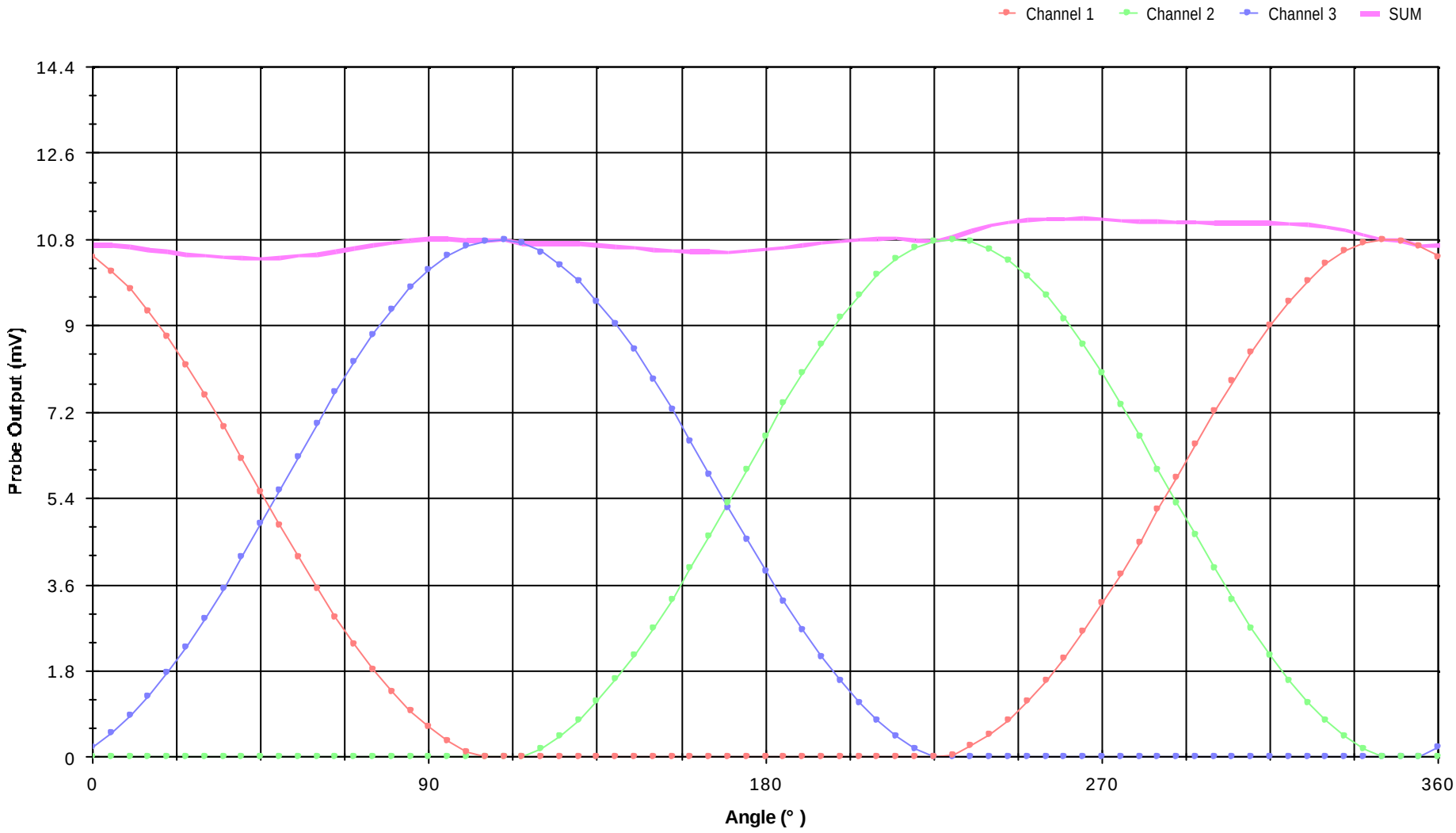


EXHIBIT 9. PROBE CALIBRATION FREE SPACE

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]

Probe Name : UT-ETR-0200-1
Type : E-field (Triangular beam), Offset(mm) : 2.25
Frequency(MHz) : 835
Amplifier Setting : 0.00529931, 0.00519731, 0.00644776
Calibrated Date : 25/02/2002 10:45:05 AM



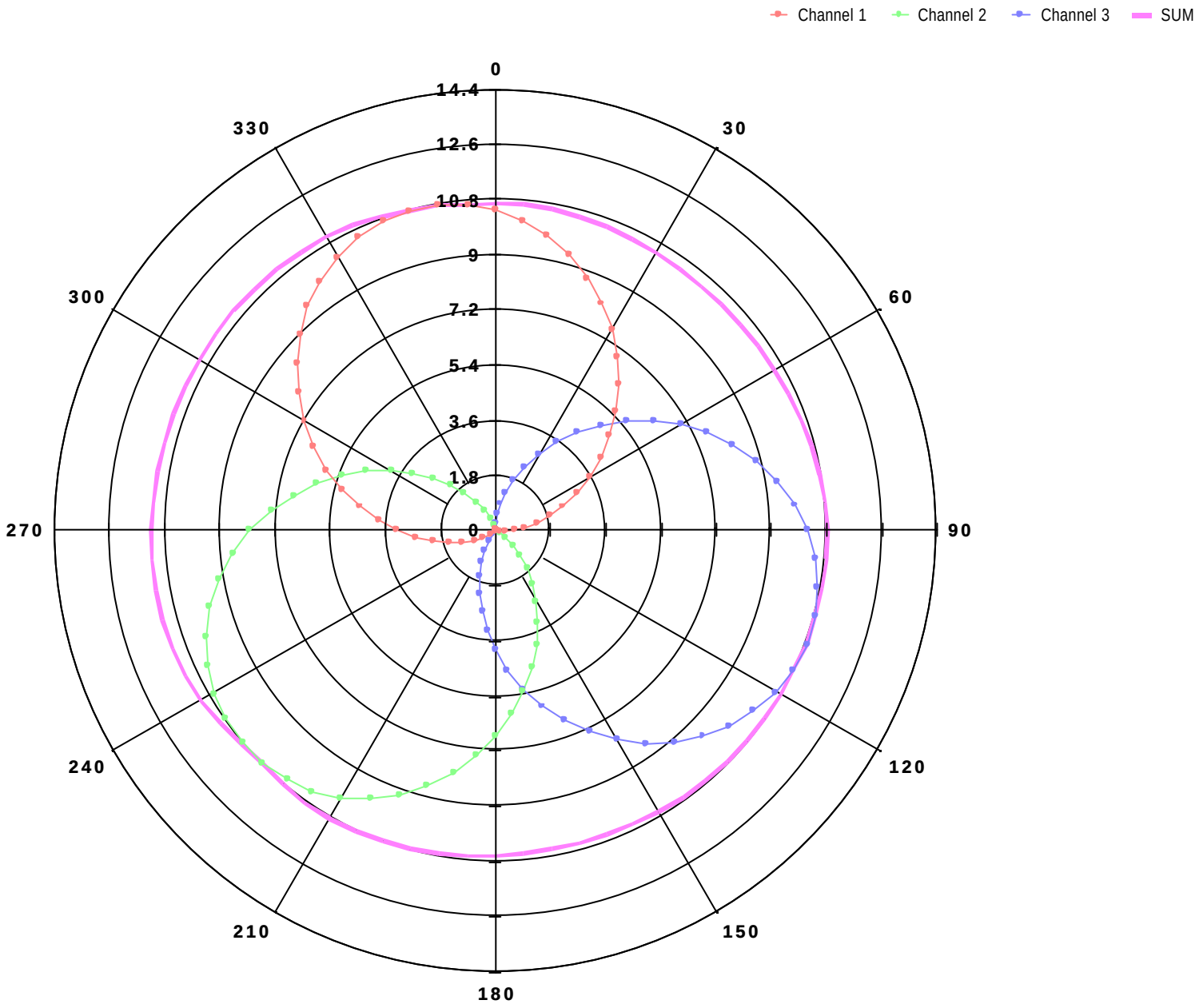
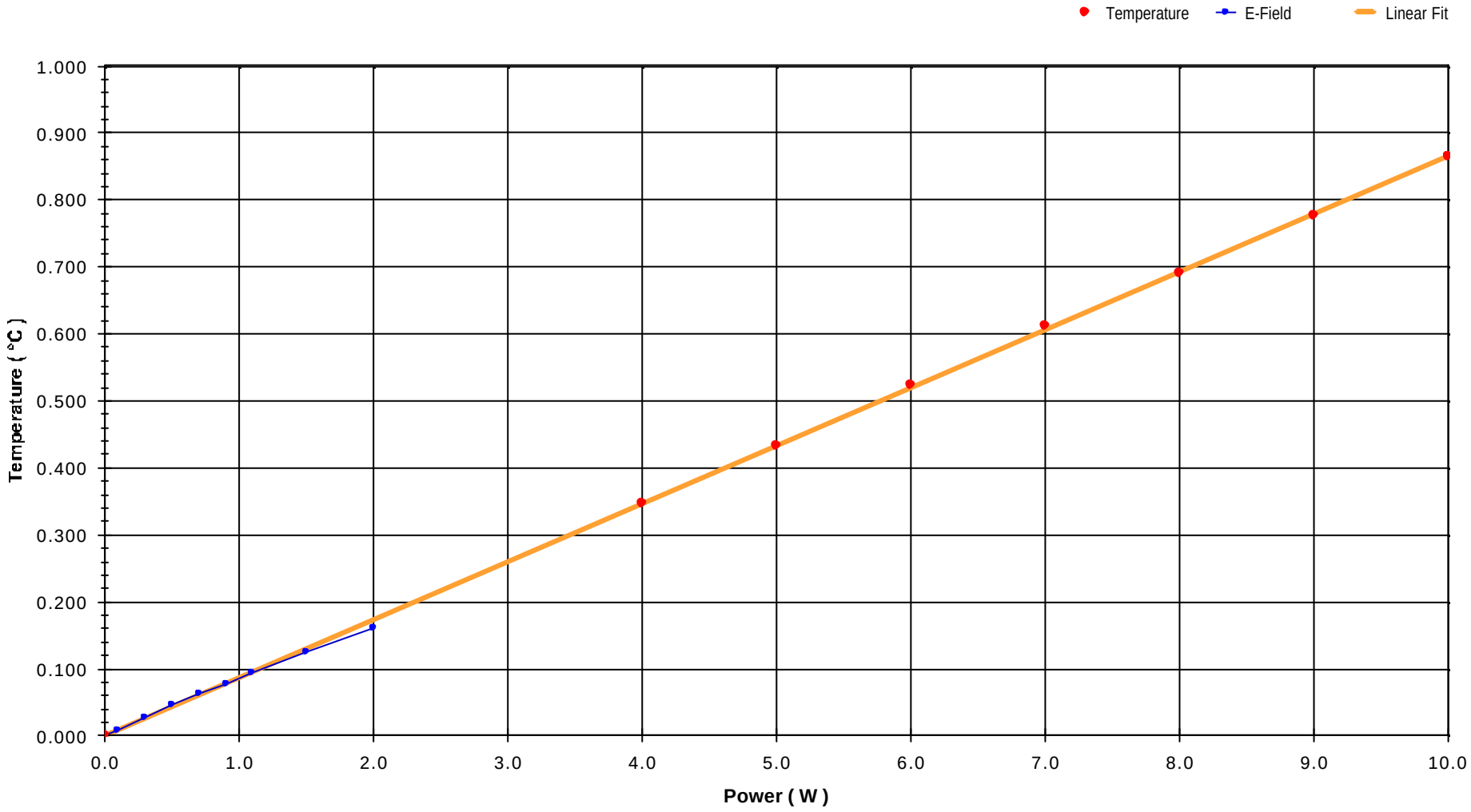

Channel 1
Channel 2
Channel 3
SUM
0
30
60
90
120
150
180
210
240
270
300
330
14.4
12.6
10.8
9
7.2
5.4
3.6
1.8
0

EXHIBIT 10. PROBE TEMPERATURE TRANSFER CALIBRATION

Probe Name : UT-ETR-0200-1
Type : E-field (Triangular beam), Offset(mm) : 2.25
Frequency(MHz) : 835, Conversion Factor : 0.9738
Simulated Tissue Type : Brain
Dielectrical Const. : 43.54, Conductivity : 0.95
Temperature - Simulated Tissue : 20.7°C, Room : 22.0°C
Calibrated Date : 21/12/2001 4:00:09 PM



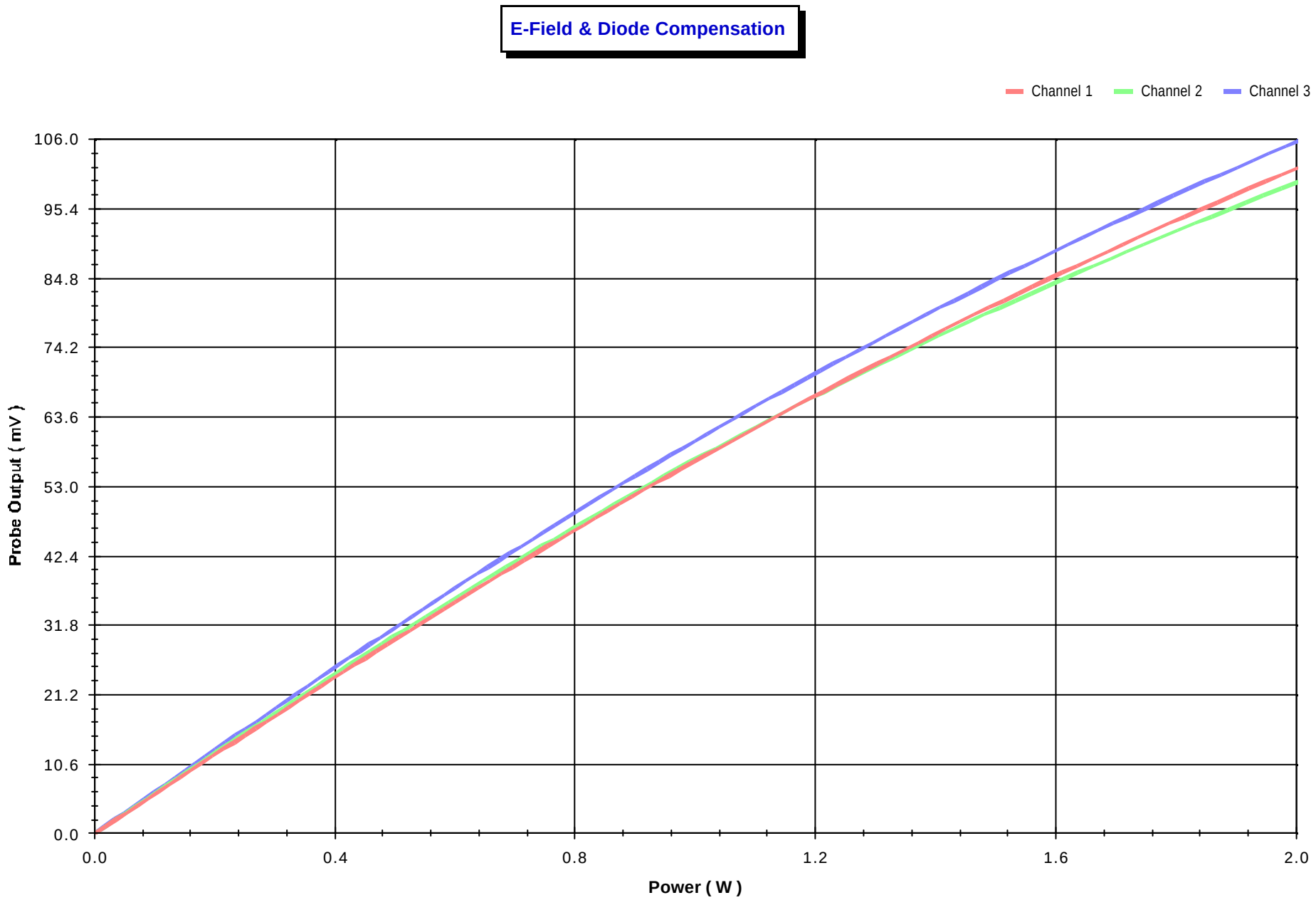
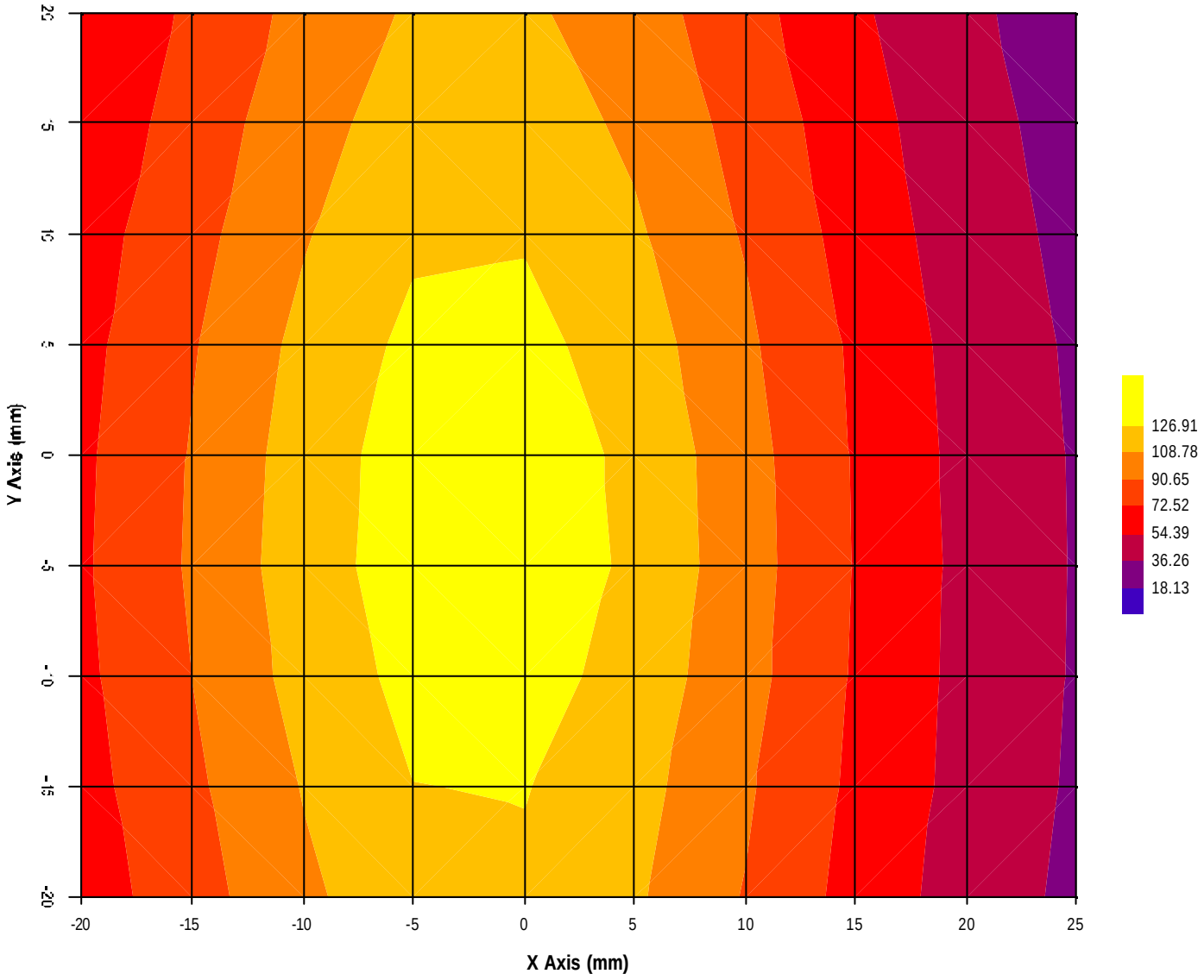
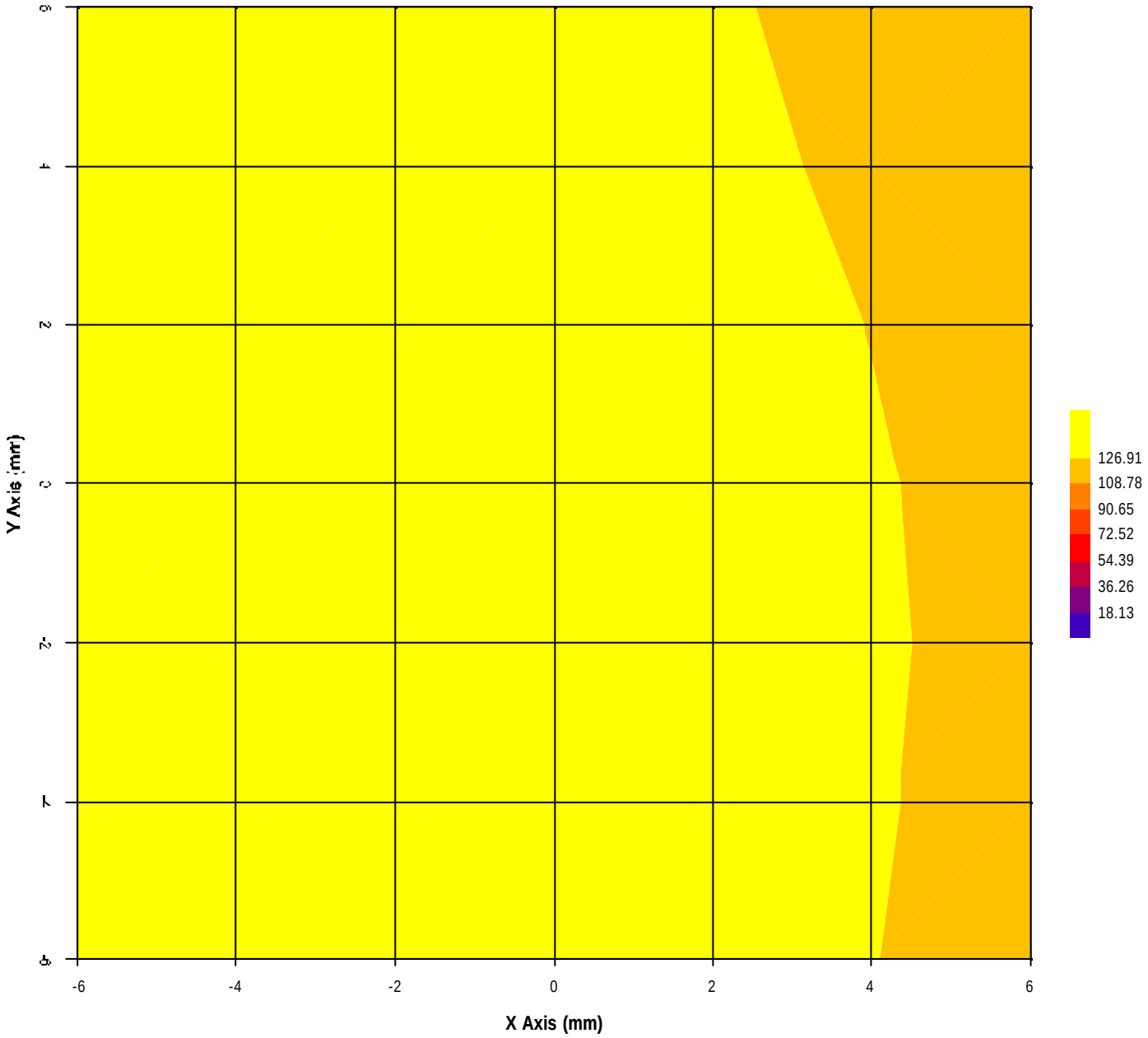

E-Field & Diode Compensation
Channel 1
Channel 2
Channel 3
106.0
95.4
84.8
74.2
63.6
53.0
42.4
31.8
21.2
10.6
0.0
Probe Output (mV)
0.0
0.4
0.8
1.2
1.6
2.0
Power (W)

EXHIBIT 11. SYSTEM VALIDATION

The system was verified in the flat phantom (2.0mm ± 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	9.934


Y Axis (mm)
X Axis (mm)
-20
-15
-10
-5
0
5
10
15
20
25
126.91
108.78
90.65
72.52
54.39
36.26
18.13


126.91
108.78
90.65
72.52
54.39
36.26
18.13
-6
-4
-2
0
2
4
6
X Axis (mm)
Y Axis (mm)