

Appendix

Tissue Calibration Result

Head Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ϵ_r	σ [S/m]	
1900 MHz	Reference result ± 5% window	40.0 38 to 42	1.4 1.33 to 1.47	N/A
	13-May-05	39.21	1.42	21.6
Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ϵ_r	σ [S/m]	
1900 MHz	Reference result ± 5% window	53.3 50.635 to 55.965	1.52 1.444 to 1.596	N/A
	13-May-05	52.50	1.54	21.6

Validation Result

System Performance Check at 1900MHz				
Validation Kit: ASL-D-1900-S-2				
Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
1900 MHz	Reference result ± 5% window	39.7 37.715 to 41.685	20.5 19.475 to 21.525	N/A
	13-May-05	39.74	20.44	21.6
Note: All SAR values are 1W forward power.				

SAR Test Results Summary

SAR MEASUREMENT						
Ambient Temperature (°C) : 22.3				Relative Humidity (%): 56		
Liquid Temperature (°C) : 21.6				Depth of Liquid (cm):>15		
Product: GSM900/DCS1800/PCS1900 GSM/GPRS Mobile Phone						
Test Position	Antenna	Frequency		Conducted Power (dBm)	SAR 1g (W/kg)	Limit (W/kg)
Body	Position	Channel	MHz			
Test Mode: PCS1900(GSM) EUT Back						
Body-wore	Internal	512	1850.2	29.3	1.170	1.6
Body-wore	Internal	661	1880.0	29.6	0.939	1.6
Body-wore	Internal	810	1909.8	29.4	0.653	1.6
Test Mode: PCS1900(GPRS) EUT Back						
Body-wore	Internal	512	1850.2	29.4	1.125	1.6
Body-wore	Internal	661	1880.0	29.6	0.813	1.6
Body-wore	Internal	810	1909.8	29.3	0.661	1.6

SAR System Validation Data

ALSAS-10U VER 2.0.0APREL Laboratories

Product Data

Device Name : Dipole-1900
 Serial No. : Validation
 Type : Dipole
 Frequency : 1900.00 MHz
 Max. Transmit Pwr : 1 W
 Drift Time : 0 min(s)
 Length : 68 mm
 Width : 3.6 mm
 Depth : 39.5 mm
 Power Drift-Start : 29.406
 Power Drift-Finish: 28.855
 Power Drift (%) : -1.876

Phantom Data

Name : APREL-Uni
 Type : Uni-Phantom
 Size : 280mm x 280mm x 200mm
 Location : Center

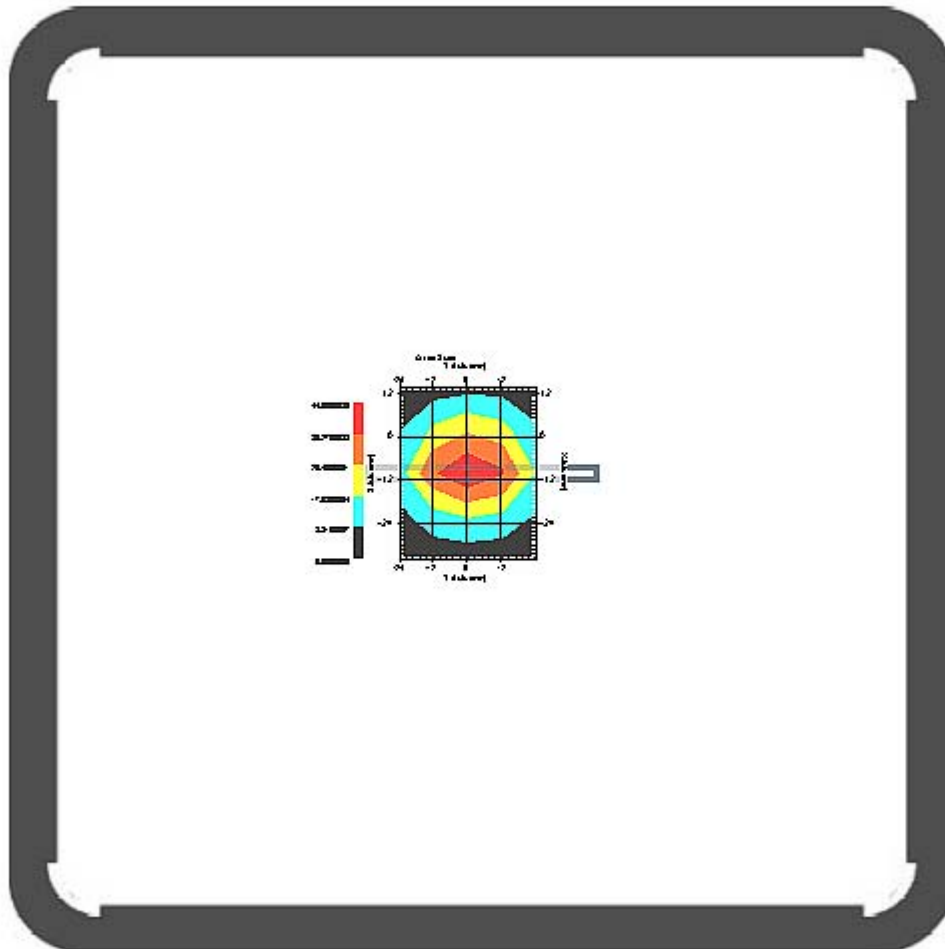
Tissue Data

Type : HEAD
 Serial No. : 324-H
 Frequency : 1900 MHz
 Calibration Date : 13-May-2005
 Temperature : 21.6 °C
 Ambient Temp. : 22.3 °C
 Humidity : 56 RH%
 Epsilon : 39.21 F/m
 Sigma : 1.42 S/m
 Density : 1000 kg/cu. m

Probe Data

Model : E020
 Type : E-Field Triangle
 Serial No. : 265
 Calibration Date : 23-Mar-2005
 Frequency : 1900 MHz
 Duty Cycle Factor: 1
 Conversion Factor: 4.9
 Probe Sensitivity: 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point: 95 mV
 Offset : 1.56

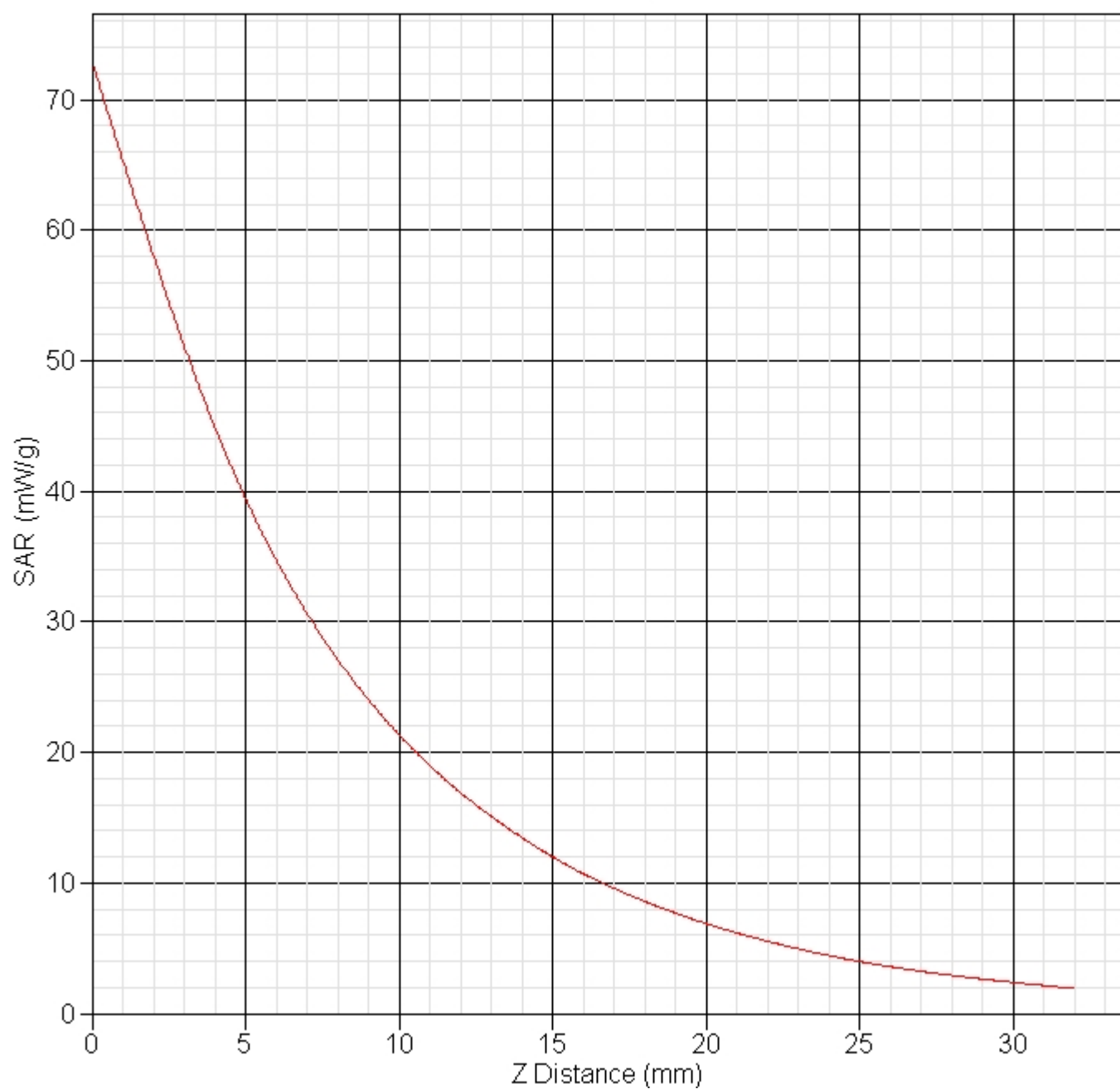
Measurement Data
Frequency : 1900



1 gram SAR value : 39.747 W/kg
10 gram SAR value : 20.441 W/kg
Area Scan Peak SAR : 44.093
Zoom Scan Peak SAR : 72.964

SAR-Z Axis

at Hotspot x:10.0 y:-2.0



SAR Measurement Data

ALSAS-10U VER 2.0.0APREL Laboratories

Product Data

Device Name : Benq_Z2
 Type : Std Form Cell Phone
 Model : Z2
 Frequency : 1900.00 MHz
 Max. Transmit Pwr : 1 W
 Drift Time : 0 min(s)
 Length : 65.8 mm
 Width : 65.8 mm
 Depth : 21.2 mm
 Antenna Type : Internal
 Power Drift-Start : 0.473
 Power Drift-Finish: 0.488
 Power Drift (%) : 3.222

Phantom Data

Name : APREL-Uni
 Type : Uni-Phantom
 Size : 280mm x 280mm x 200mm
 Location : Center

Tissue Data

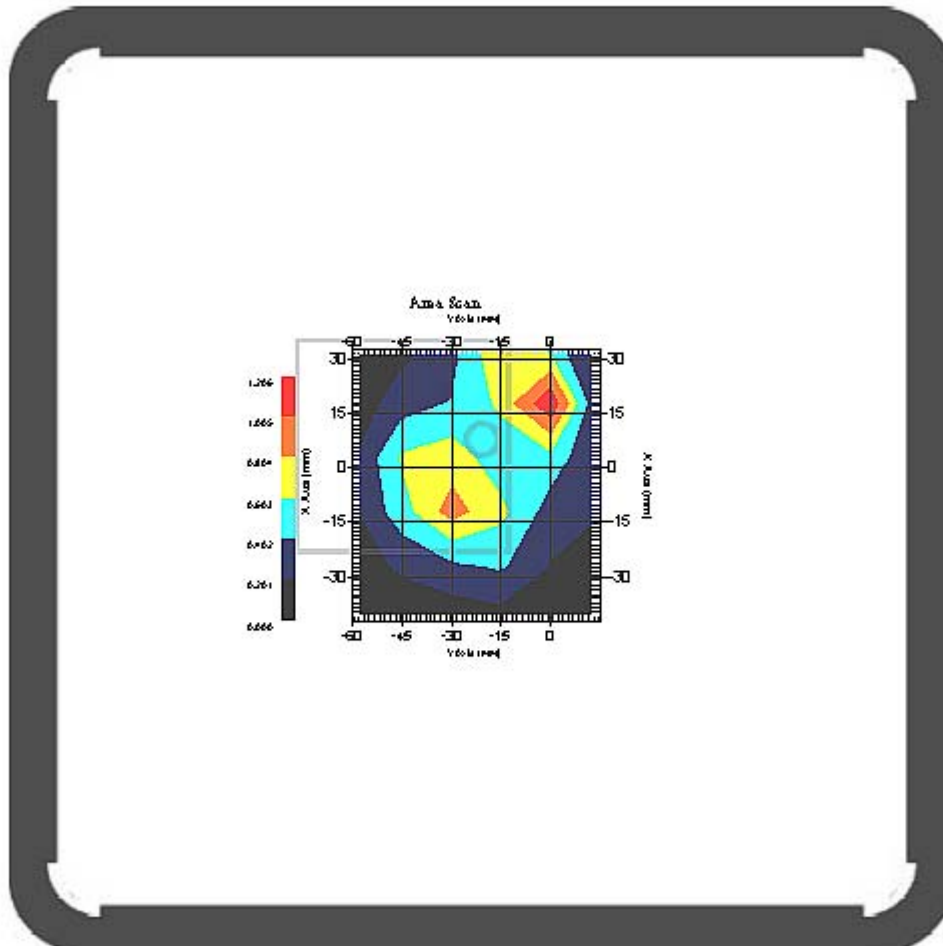
Type : BODY
 Serial No. : 324-B
 Frequency : 1900 MHz
 Calibration Date : 13-May-2005
 Temperature : 21.6 °C
 Ambient Temp. : 22.3 °C
 Humidity : 56 RH%
 Epsilon : 52.5 F/m
 Sigma : 1.54 S/m
 Density : 1000 kg/cu. m

Probe Data

Model : E020
 Type : E-Field Triangle
 Serial No. : 265
 Calibration Date : 23-Mar-2005
 Frequency : 1900 MHz
 Duty Cycle Factor: 8
 Conversion Factor: 5.1
 Probe Sensitivity: 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point: 95 mV
 Offset : 1.56

Measurement Data

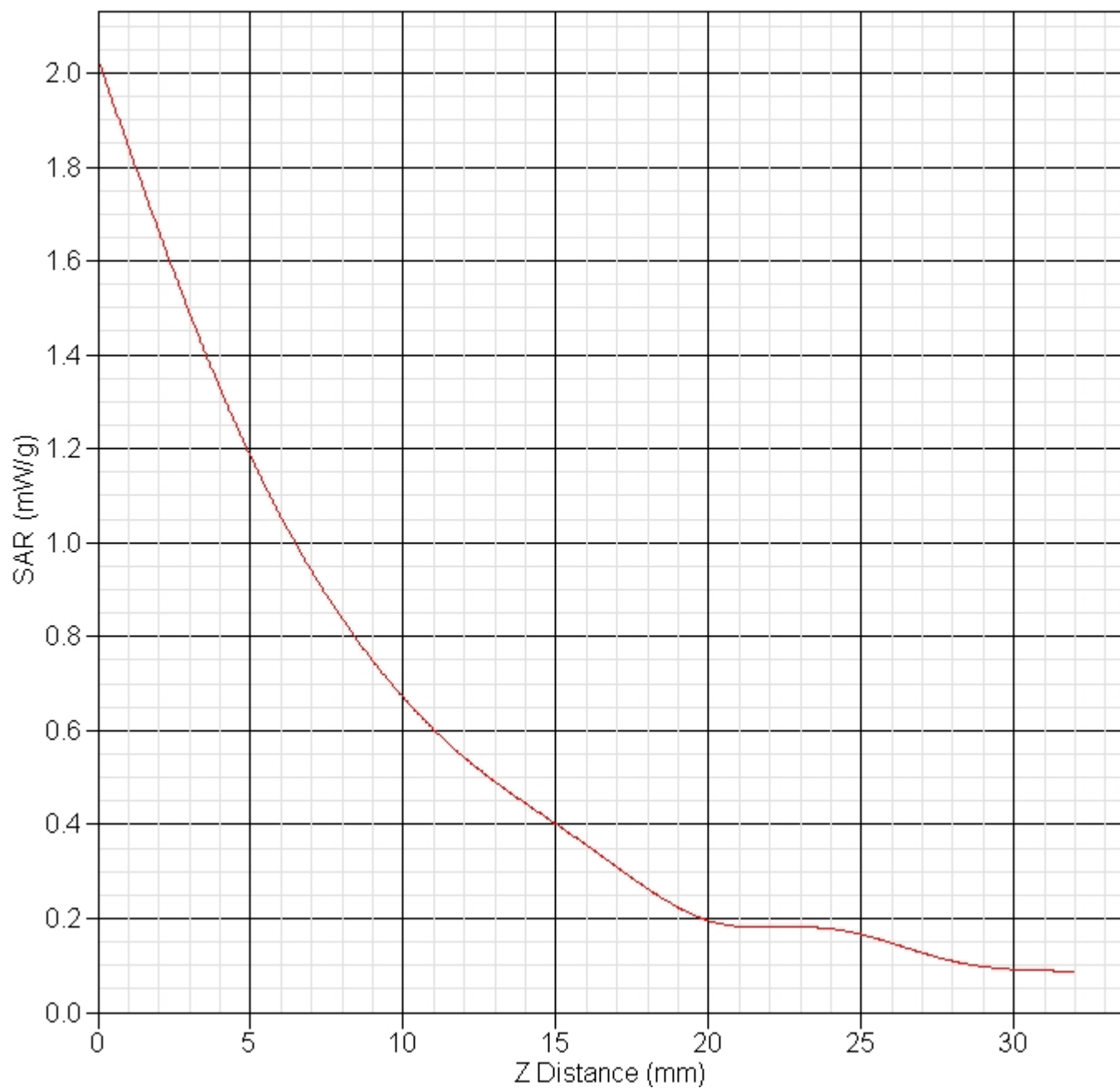
DUT Position : Touch(GSM)
Channel : 512



1 gram SAR value : 1.170 W/kg
10 gram SAR value : 0.636 W/kg
Area Scan Peak SAR : 1.201
Zoom Scan Peak SAR : 2.031

SAR-Z Axis

at Hotspot x:-26.0 y:-8.0



ALSAS-10U VER 2.0.0APREL Laboratories

Product Data

Device Name : Benq_Z2
 Type : Std Form Cell Phone
 Model : Z2
 Frequency : 1900.00 MHz
 Max. Transmit Pwr : 1 W
 Drift Time : 0 min(s)
 Length : 65.8 mm
 Width : 65.8 mm
 Depth : 21.2 mm
 Antenna Type : Internal
 Power Drift-Start : 0.393
 Power Drift-Finish: 0.408
 Power Drift (%) : 3.817

Phantom Data

Name : APREL-Uni
 Type : Uni-Phantom
 Size : 280mm x 280mm x 200mm
 Location : Center

Tissue Data

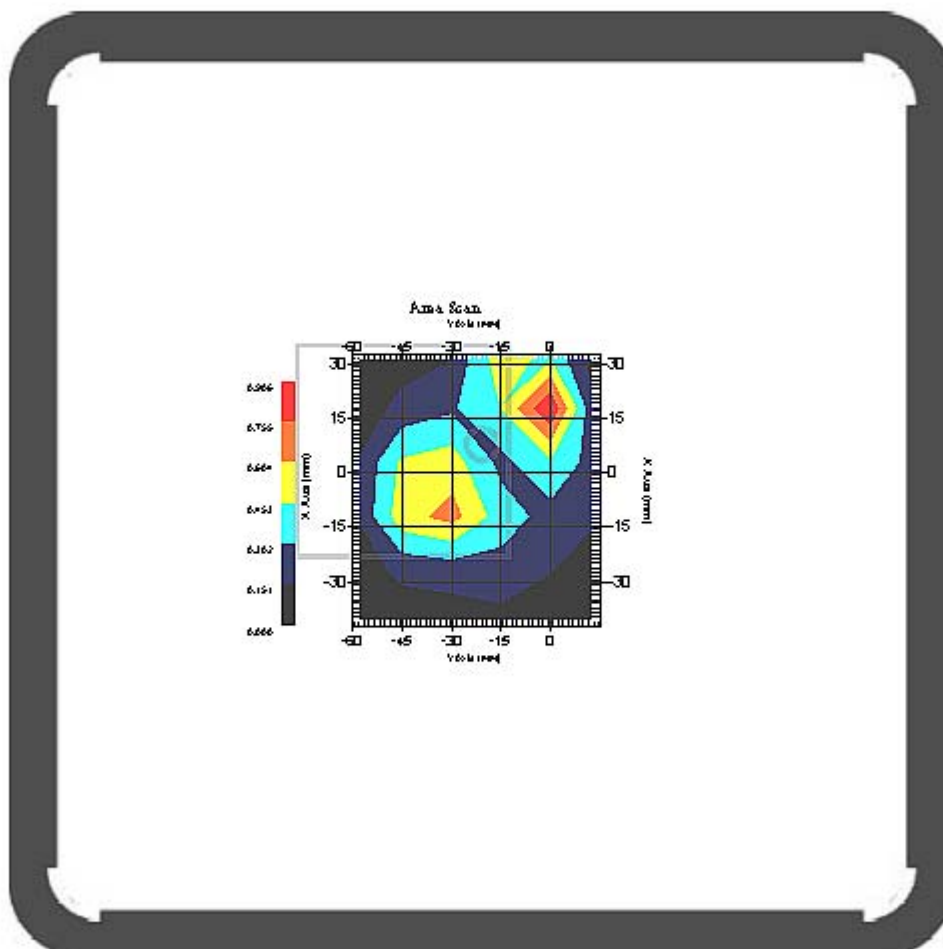
Type : BODY
 Serial No. : 324-B
 Frequency : 1900 MHz
 Calibration Date : 13-May-2005
 Temperature : 21.6 °C
 Ambient Temp. : 22.3 °C
 Humidity : 56 RH%
 Epsilon : 52.5 F/m
 Sigma : 1.54 S/m
 Density : 1000 kg/cu. m

Probe Data

Model : E020
 Type : E-Field Triangle
 Serial No. : 265
 Calibration Date : 23-Mar-2005
 Frequency : 1900 MHz
 Duty Cycle Factor: 8
 Conversion Factor: 5.1
 Probe Sensitivity: 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point: 95 mV
 Offset : 1.56

Measurement Data

DUT Position : Touch(GSM)
Channel : 661



1 gram SAR value : 0.939 W/kg
10 gram SAR value : 0.509 W/kg
Area Scan Peak SAR : 0.900
Zoom Scan Peak SAR : 1.721

ALSAS-10U VER 2.0.0APREL Laboratories

Product Data

Device Name : Benq_Z2
 Type : Std Form Cell Phone
 Model : Z2
 Frequency : 1900.00 MHz
 Max. Transmit Pwr : 1 W
 Drift Time : 0 min(s)
 Length : 65.8 mm
 Width : 65.8 mm
 Depth : 21.2 mm
 Antenna Type : Internal
 Power Drift-Start : 0.304
 Power Drift-Finish: 0.308
 Power Drift (%) : 0.329

Phantom Data

Type : Uni-Phantom
 Size : 280mm x 280mm x 200mm
 Location : Center

Tissue Data

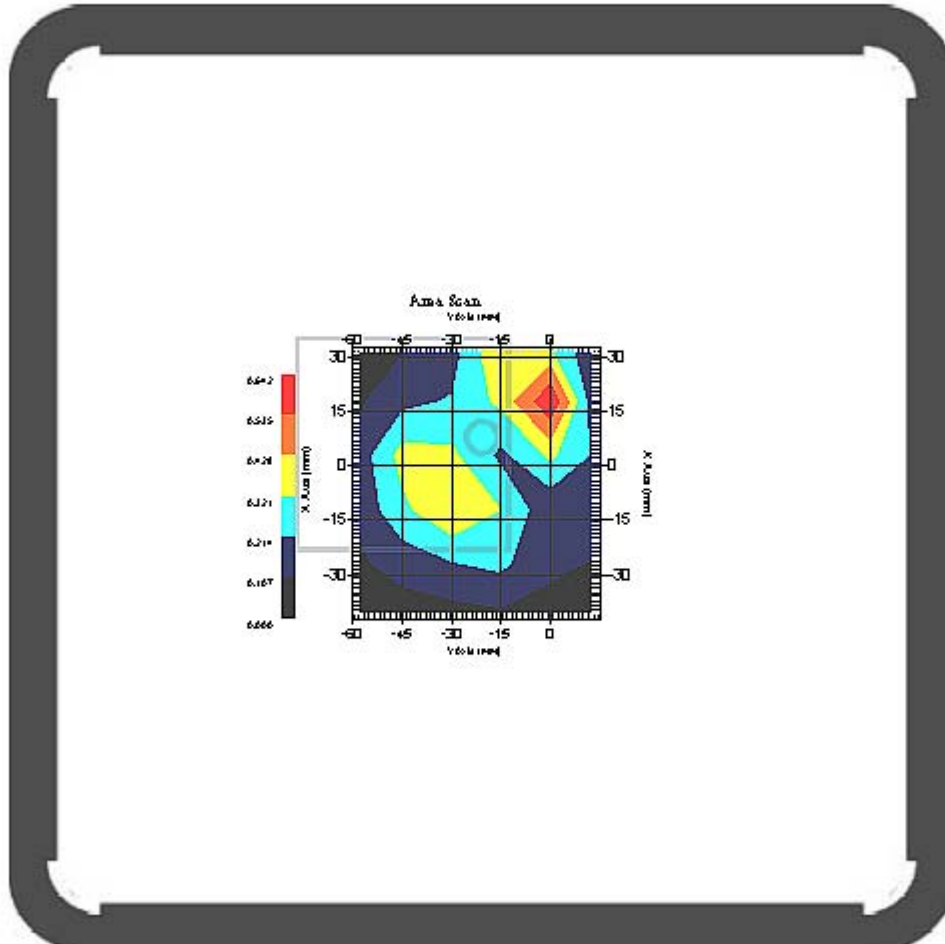
Type : BODY
 Serial No. : 324-B
 Frequency : 1900 MHz
 Calibration Date : 13-May-2005
 Temperature : 21.6 °C
 Ambient Temp. : 22.3 °C
 Humidity : 56 RH%
 Epsilon : 52.5 F/m
 Sigma : 1.54 S/m
 Density : 1000 kg/cu. m

Probe Data

Model : E020
 Type : E-Field Triangle
 Serial No. : 265
 Calibration Date : 23-Mar-2005
 Frequency : 1900 MHz
 Duty Cycle Factor: 8
 Conversion Factor: 5.1
 Probe Sensitivity: 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point: 95 mV
 Offset : 1.56

Measurement Data

DUT Position : Touch(GSM)
Channel : 810



1 gram SAR value : 0.653 W/kg
10 gram SAR value : 0.387 W/kg
Area Scan Peak SAR : 0.634
Zoom Scan Peak SAR : 0.980

ALSAS-10U VER 2.0.0APREL Laboratories

Product Data

Device Name : Benq_Z2
 Type : Std Form Cell Phone
 Model : Z2
 Frequency : 1900.00 MHz
 Max. Transmit Pwr : 1 W
 Drift Time : 0 min(s)
 Length : 65.8 mm
 Width : 65.8 mm
 Depth : 21.2 mm
 Antenna Type : Internal
 Power Drift-Start : 0.416
 Power Drift-Finish: 0.427
 Power Drift (%) : 2.644

Phantom Data

Type : Uni-Phantom
 Size : 280mm x 280mm x 200mm
 Location : Center

Tissue Data

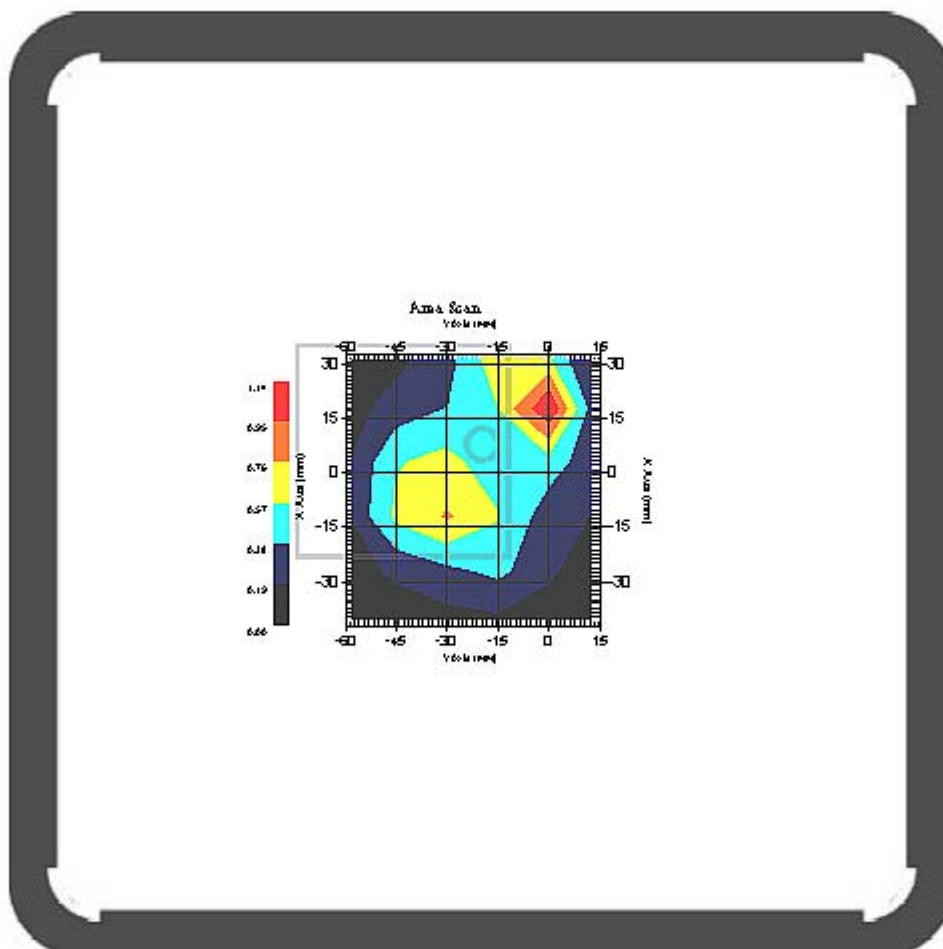
Type : BODY
 Serial No. : 324-B
 Frequency : 1900 MHz
 Calibration Date : 13-May-2005
 Temperature : 21.6 °C
 Ambient Temp. : 22.3 °C
 Humidity : 56 RH%
 Epsilon : 52.5 F/m
 Sigma : 1.54 S/m
 Density : 1000 kg/cu. m

Probe Data

Model : E020
 Type : E-Field Triangle
 Serial No. : 265
 Calibration Date : 23-Mar-2005
 Frequency : 1900 MHz
 Duty Cycle Factor: 4
 Conversion Factor: 5.1
 Probe Sensitivity: 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point: 95 mV
 Offset : 1.56

Measurement Data

DUT Position : Touch(GPRS)
Channel : 512



1 gram SAR value : 1.125 W/kg
10 gram SAR value : 0.614 W/kg
Area Scan Peak SAR : 1.137
Zoom Scan Peak SAR : 2.021

ALSAS-10U VER 2.0.0APREL Laboratories

Product Data

Device Name : Benq_Z2
 Type : Std Form Cell Phone
 Model : Z2
 Frequency : 1900.00 MHz
 Max. Transmit Pwr : 1 W
 Drift Time : 0 min(s)
 Length : 65.8 mm
 Width : 65.8 mm
 Depth : 21.2 mm
 Antenna Type : Internal
 Power Drift-Start : 0.345
 Power Drift-Finish: 0.351
 Power Drift (%) : 1.739

Phantom Data

Type : Uni-Phantom
 Size : 280mm x 280mm x 200mm
 Location : Center

Tissue Data

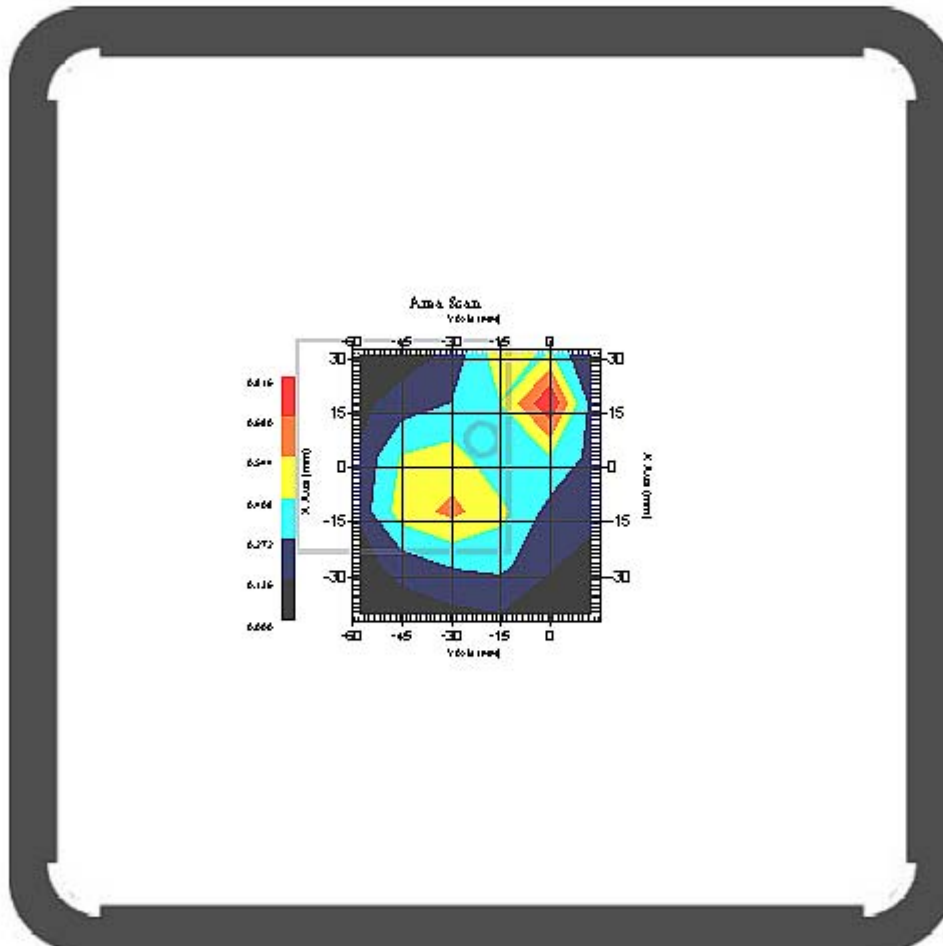
Type : BODY
 Serial No. : 324-B
 Frequency : 1900 MHz
 Calibration Date : 13-May-2005
 Temperature : 21.6 °C
 Ambient Temp. : 22.3 °C
 Humidity : 56 RH%
 Epsilon : 52.5 F/m
 Sigma : 1.54 S/m
 Density : 1000 kg/cu. m

Probe Data

Model : E020
 Type : E-Field Triangle
 Serial No. : 265
 Calibration Date : 23-Mar-2005
 Frequency : 1900 MHz
 Duty Cycle Factor: 4
 Conversion Factor: 5.1
 Probe Sensitivity: 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point: 95 mV
 Offset : 1.56

Measurement Data

DUT Position : Touch(GPRS)
Channel : 661



1 gram SAR value : 0.813 W/kg
10 gram SAR value : 0.461 W/kg
Area Scan Peak SAR : 0.809
Zoom Scan Peak SAR : 1.441

ALSAS-10U VER 2.0.0APREL Laboratories

Product Data

Device Name : Benq_Z2
 Type : Std Form Cell Phone
 Model : Z2
 Frequency : 1900.00 MHz
 Max. Transmit Pwr : 1 W
 Drift Time : 0 min(s)
 Length : 65.8 mm
 Width : 65.8 mm
 Depth : 21.2 mm
 Antenna Type : Internal
 Power Drift-Start : 0.291
 Power Drift-Finish: 0.303
 Power Drift (%) : 4.123

Phantom Data

Type : Uni-Phantom
 Size : 280mm x 280mm x 200mm
 Location : Center

Tissue Data

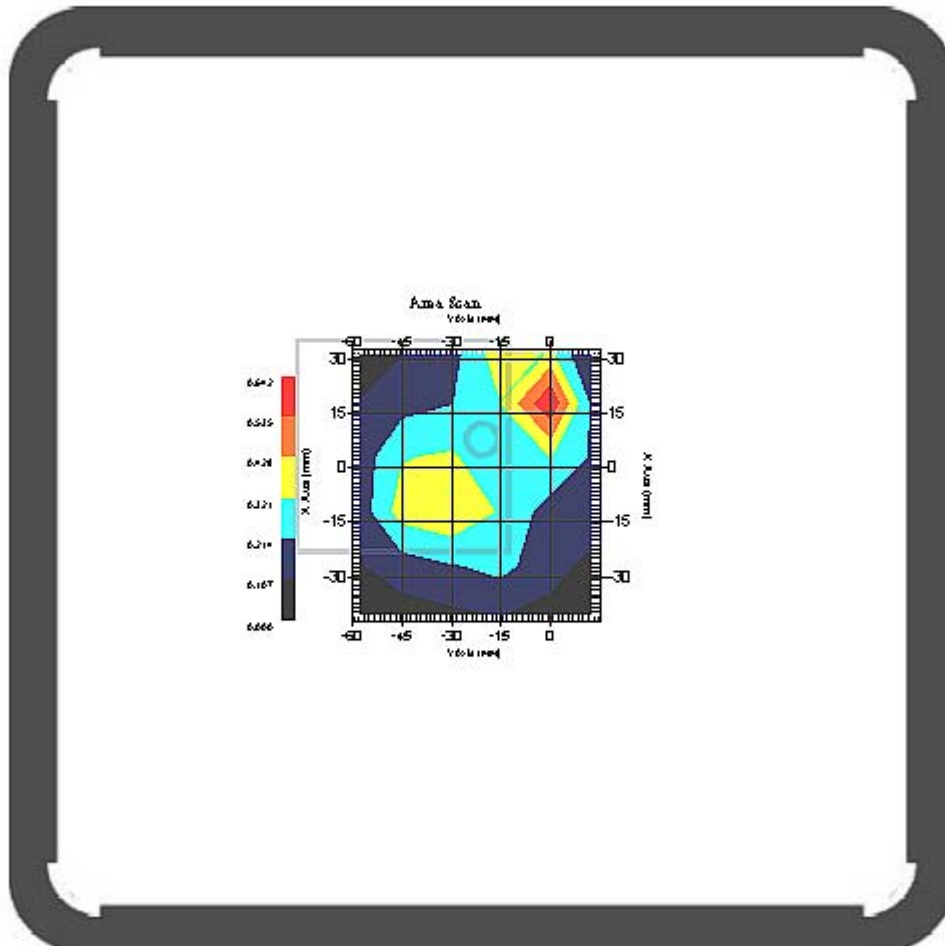
Type : BODY
 Serial No. : 324-B
 Frequency : 1900 MHz
 Calibration Date : 13-May-2005
 Temperature : 21.6 °C
 Ambient Temp. : 22.3 °C
 Humidity : 56 RH%
 Epsilon : 52.5 F/m
 Sigma : 1.54 S/m
 Density : 1000 kg/cu. m

Probe Data

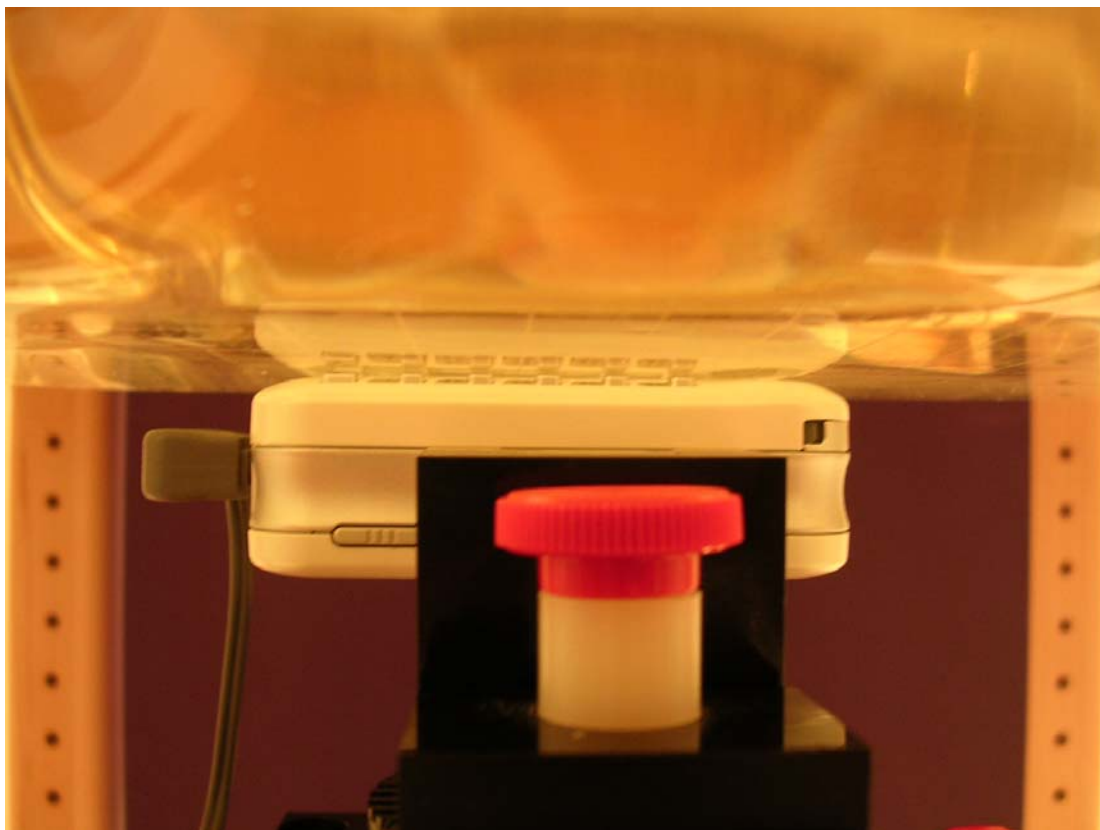
Model : E020
 Type : E-Field Triangle
 Serial No. : 265
 Calibration Date : 23-Mar-2005
 Frequency : 1900 MHz
 Duty Cycle Factor: 4
 Conversion Factor: 5.1
 Probe Sensitivity: 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point: 95 mV
 Offset : 1.56

Measurement Data

DUT Position : Touch(GPRS)
Channel : 810



1 gram SAR value : 0.661 W/kg
10 gram SAR value : 0.394 W/kg
Area Scan Peak SAR : 0.634
Zoom Scan Peak SAR : 1.060

Test Setup Photographs**Body worn bottom (EUT Back Touch)**

Probe Calibration

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-555

Client: QUIETEK

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the
NCL CALIBRATION LABORATORIES by qualified personnel following recognized
procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories

Model No.: ALS-E-020

Serial No.: 265

HEAD Calibration

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: QTKB-ALS-E-020 Probe Cal-S091

Calibrated: 23rd March 2005

Released on: 23rd March 2005

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1K6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 265.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 265 was a new probe taken from stock prior to calibration.

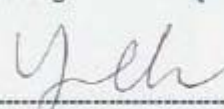
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C

Temperature of the Tissue: 21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.



Ron Dulmage



Y. Chen

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This page has been reviewed for content and attested to on Page 2 of this document.

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Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	265
Frequency:	1900 MHz
Sensor Offset:	1.56 mm
Sensor Length:	2.5 mm
Tip Enclosure:	Ertalyte*
Tip Diameter:	<5 mm
Tip Length:	60 mm
Total Length:	290 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Y:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Z:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Diode Compression Point:	95 mV

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Sensitivity in Head Tissue

Frequency: 1900 MHz

Epsilon: 40.0 (+/-5%) Sigma: 1.40 S/m (+/-5%)

ConvF

Channel X: 4.9

Channel Y: 4.9

Channel Z: 4.9

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

Spatial Resolution:

The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

NCL Calibration Laboratories

Division of APREL Laboratories.

Sensitivity in Head Tissue

Frequency: 1900 MHz

Epsilon: 40.0 (+/-5%) **Sigma:** 1.40 S/m (+/-5%)

ConvF

Channel X: 4.9

Channel Y: 4.9

Channel Z: 4.9

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

Spatial Resolution:

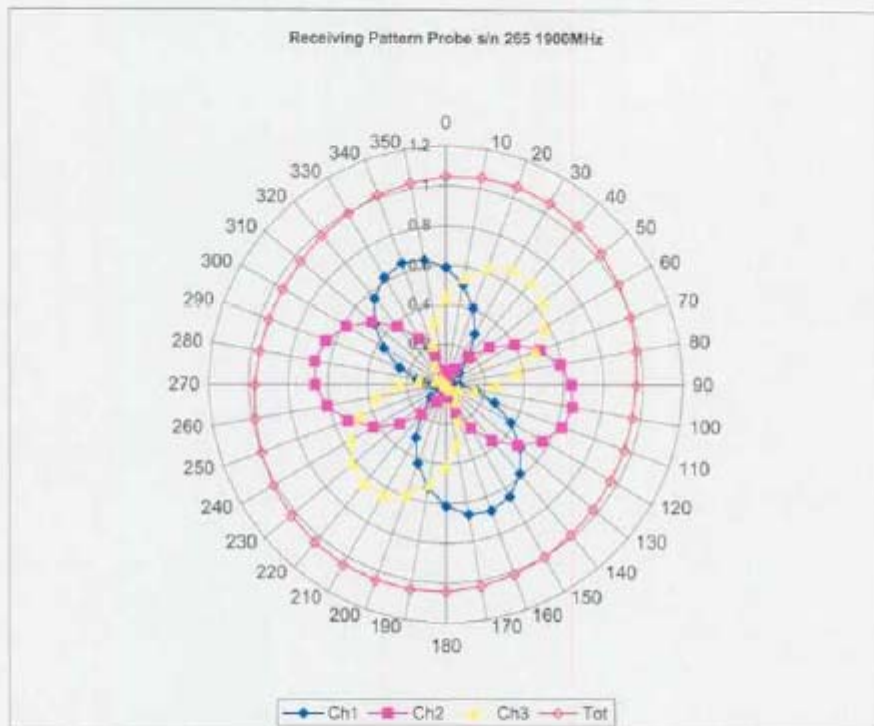
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

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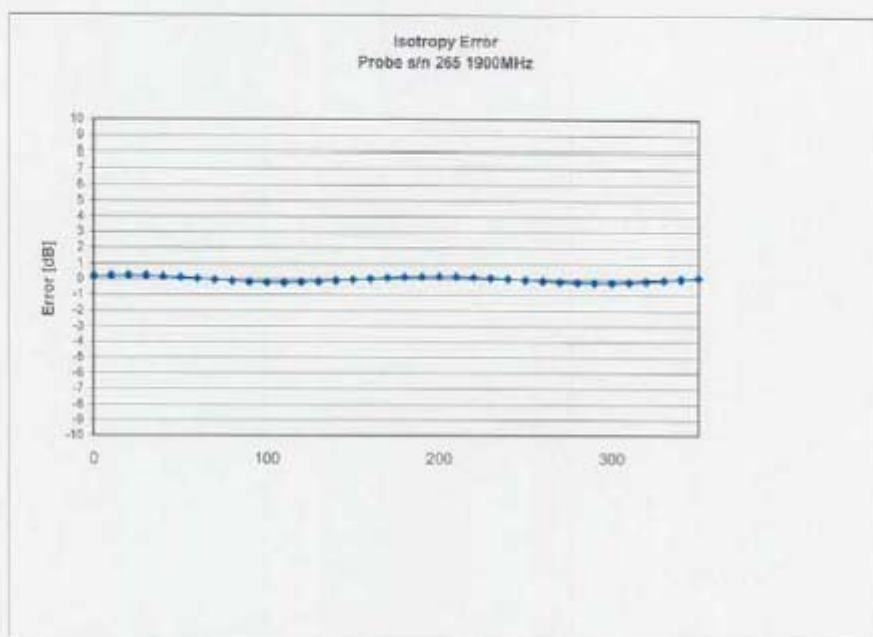
Receiving Pattern 1900 MHz (Air)



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Isotropy Error 1900 MHz (Air)



Isotropy in Tissue:

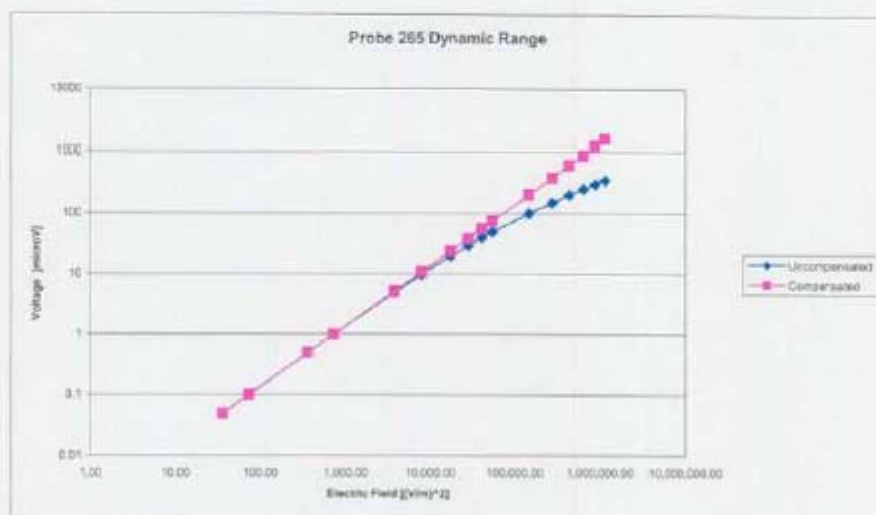
0.10 dB

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Dynamic Range

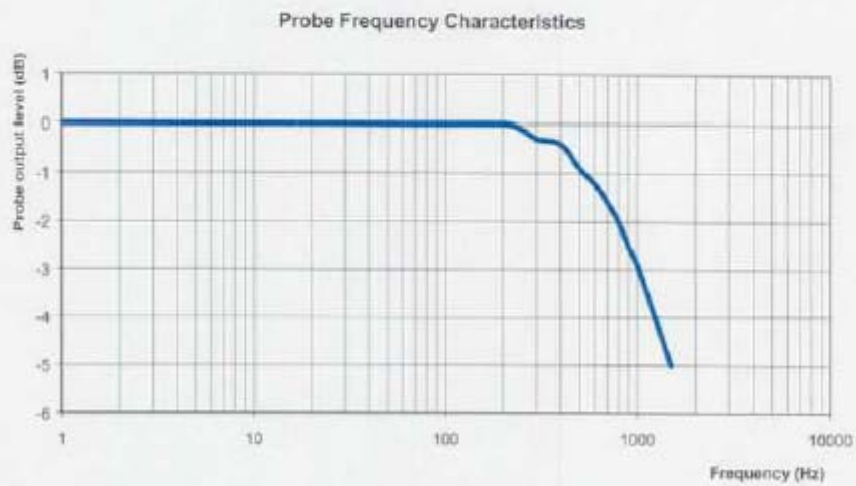


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Video Bandwidth



Video Bandwidth at 500 Hz 1 dB
Video Bandwidth at 1000 Hz 3 dB

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Conversion Factor Uncertainty Assessment

Frequency:	1900MHz		
Epsilon:	40.0 (+/-5%)	Sigma:	1.40 S/m (+/-5%)
ConvF			
Channel X:	4.9		7%(K=2)
Channel Y:	4.9		7%(K=2)
Channel Z:	4.9		7%(K=2)

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

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Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2004.

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NCL CALIBRATION LABORATORIES

Calibration File No.: CP-556

Client: QUIETEK

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the
NCL CALIBRATION LABORATORIES by qualified personnel following recognized
procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories

Model No.: ALS-E-020

Serial No.: 265

BODY Calibration

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: QTKB-ALS-E-020 Probe Cal-5091

Calibrated: 23rd March 2005Released on: 23rd March 2005

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____

NCL CALIBRATION LABORATORIES51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E8Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4191

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 265.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 265 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C

Temperature of the Tissue: 21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.



Ron Dulmage



Y. Chen

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Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	265
Frequency:	1900 MHz
Sensor Offset:	1.56 mm
Sensor Length:	2.5 mm
Tip Enclosure:	Ertalyte*
Tip Diameter:	<5 mm
Tip Length:	60 mm
Total Length:	290 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Y:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Z:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Diode Compression Point:	95 mV

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NCL Calibration Laboratories

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Sensitivity in Body Tissue

Frequency: 1900 MHz

Epsilon: 53.3 (+/-5%) **Sigma:** 1.52 S/m (+/-5%)

ConvF

Channel X: 5.1

Channel Y: 5.1

Channel Z: 5.1

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

Spatial Resolution:

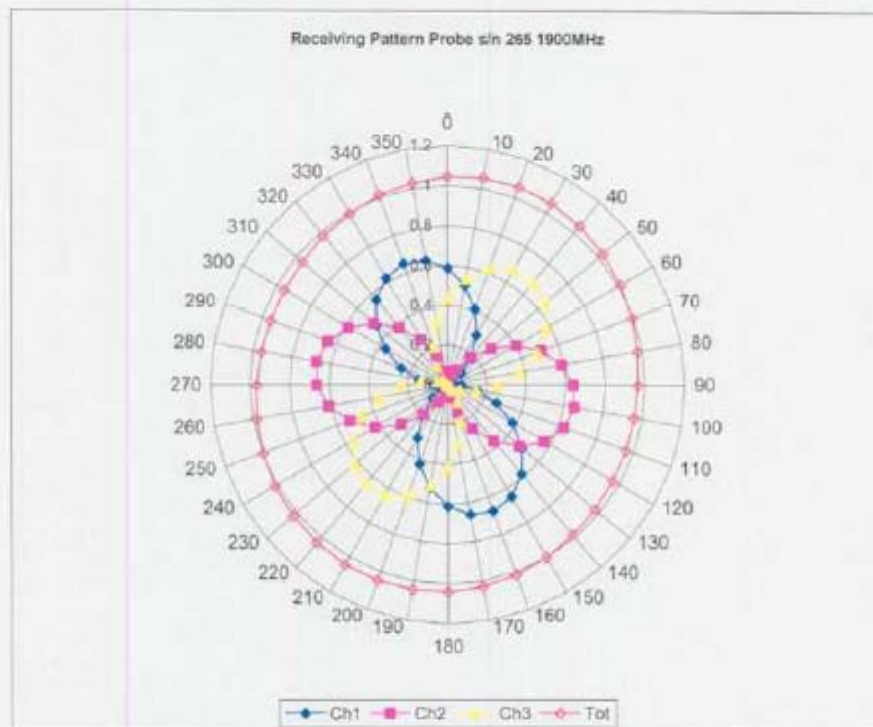
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

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Receiving Pattern 1900 MHz (Air)

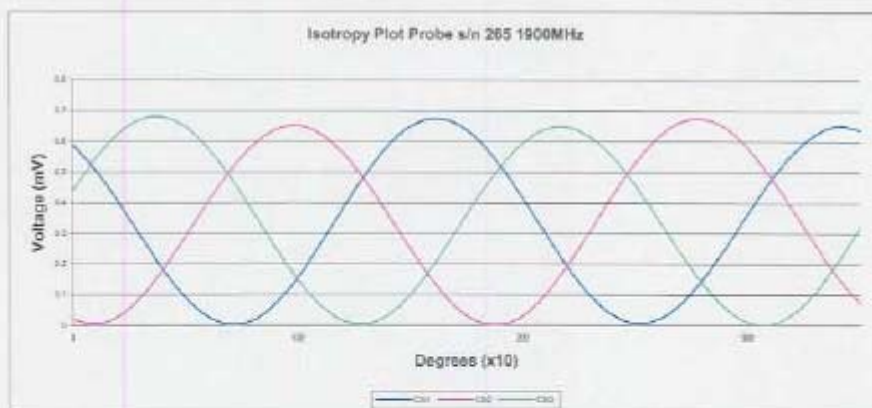
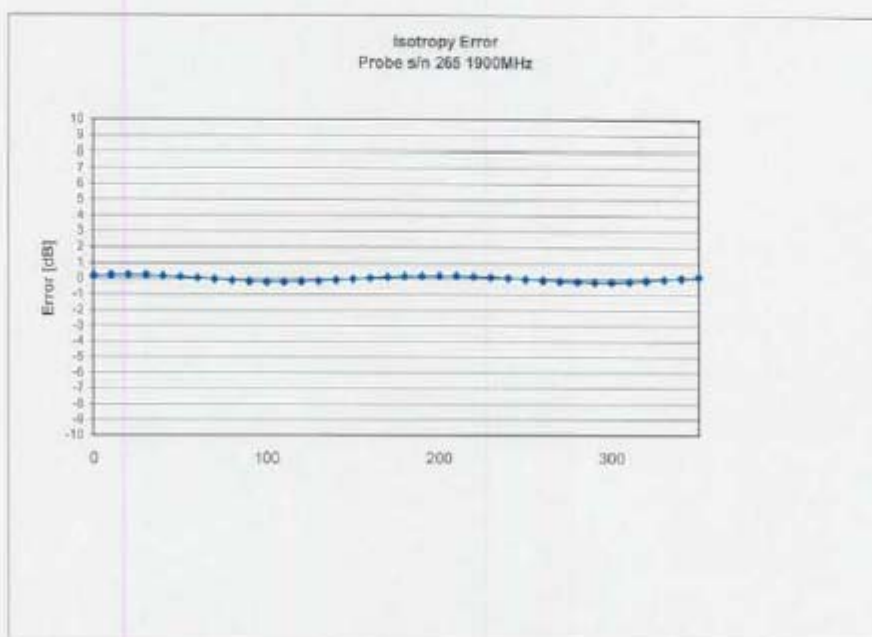


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Isotropy Error 1900 MHz (Air)



Isotropy in Tissue:

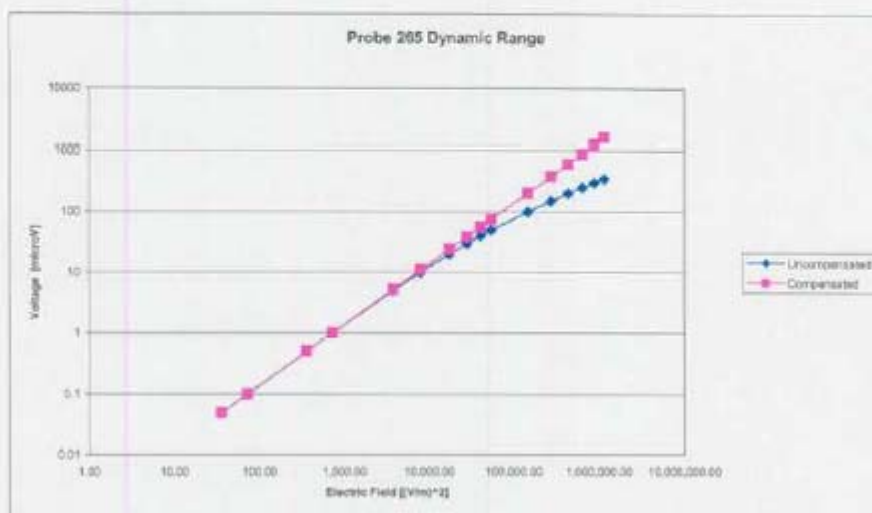
0.10 dB

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Dynamic Range



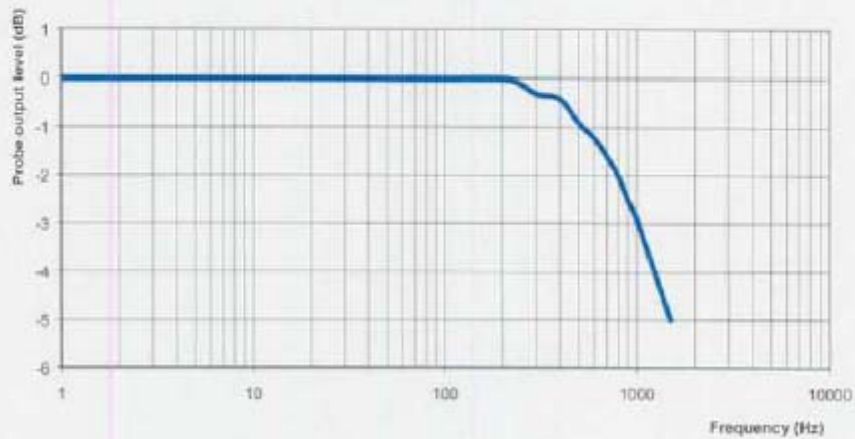
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Video Bandwidth

Probe Frequency Characteristics



Video Bandwidth at 500 Hz 1 dB
Video Bandwidth at 1000 Hz 3 dB

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Conversion Factor Uncertainty Assessment

Frequency:	1900MHz		
Epsilon:	53.3 (+/-5%)	Sigma:	1.52 S/m (+/-5%)
ConvF			
Channel X:	5.1		7%(K=2)
Channel Y:	5.1		7%(K=2)
Channel Z:	5.1		7%(K=2)

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

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Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2004.

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