

SAR DATA REPORT

START : 29-MAY-03 02:30:44 AM
END : 29-MAY-03 02:36:28 AM
CODE VERSION : 4.12
ROBOT VERSION: 4.08

PRODUCT DATA:

TYPE : ACER LAPTOP
FREQUENCY : 5320 MHZ
ANTENNA TYPE : END FED
ANTENNA POSN. : INTERNAL

MEASUREMENT DATA:

PHANTOM NAME : APREL-UNI
PHANTOM TYPE : UNIPHANTOM
TISSUE TYPE : MUSCLE
TISSUE DIELECTRIC : 44.000
TISSUE CONDUCTIVITY : 6.600
TISSUE DENSITY : 1.000
CREST FACTOR : 1.000
ROBOT NAME : CRS

PROBE DATA:

PROBE NAME : 163
PROBE TYPE : E FLD TRIANGLE
FREQUENCY : 5245 MHZ
TISSUE TYPE : MUSCLE
CALIBRATED DIELECTRIC : 44.000
CALIBRATED CONDUCTIVITY : 6.600
PROBE OFFSET : 2.500 MM
CONVERSION FACTOR : 3.000
DIODE COMPRESSION PT : 76.0 MV
PROBE SENSITIVITY : 0.580 0.580 0.580 MV/(MW/CM^2)
AMPLIFIER GAINS : 20.00 20.00 20.00
CHAN. OFFSET (MV) : -5.07 3.28 -0.78

SAMPLE:

RATE: 6000 SAMPLES/SEC
COUNT: 1000 SAMPLES
NIDAQ GAIN: 5
SCAN TIME: 166.7 MSEC

COMMENTS:

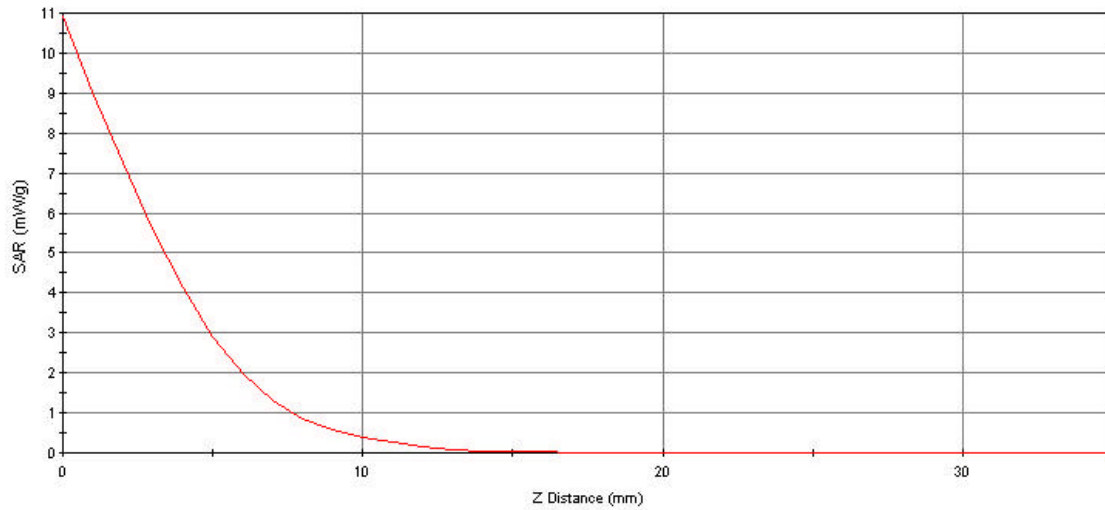
FRONT 0MM, LCD OUT

AREA SCAN - MAX LOCAL SAR VALUE AT X=23.0 Y=56.0 = 2.53 W/KG
ZOOM SCAN - MAX LOCAL SAR VALUE AT X=22.0 Y=57.0 Z=0.0 = 10.91 W/KG
MAX 1G SAR AT X=22.0 Y=58.0 Z=0.0 = 3.74 W/KG
MAX 10G SAR AT X=20.0 Y=57.0 Z=0.0 = 1.12 W/KG



Z AXIS SCAN

SAR - Z Axis
at Hotspot x:22.0 y:57.0



GRAPH 4

Body SAR (1g)
Keyboard Up
Distance 10 mm
Mid Channel
Frequency: 5260 MHz
Duty Cycle 1



Date	Dielectric Constant ϵ_r	Conductivity σ [S/m]	Probe Con/F	Tissue Temp ($^{\circ}\text{C}$)	1g SAR (W/kg)	Power Drift
29/05/03	44.0	6.60	3.0	21	0.65	0

SAR DATA REPORT

START : 29-MAY-03 02:15:29 AM
END : 29-MAY-03 02:21:11 AM
CODE VERSION : 4.12
ROBOT VERSION: 4.08

PRODUCT DATA:

TYPE : ACER LAPTOP
FREQUENCY : 5260 MHZ
ANTENNA TYPE : END FED
ANTENNA POSN. : INTERNAL

MEASUREMENT DATA:

PHANTOM NAME : APREL-UNI
PHANTOM TYPE : UNIPHANTOM
TISSUE TYPE : MUSCLE
TISSUE DIELECTRIC : 44.000
TISSUE CONDUCTIVITY : 6.600
TISSUE DENSITY : 1.000
CREST FACTOR : 1.000
ROBOT NAME : CRS

PROBE DATA:

PROBE NAME : 163
PROBE TYPE : E FLD TRIANGLE
FREQUENCY : 5245 MHZ
TISSUE TYPE : MUSCLE
CALIBRATED DIELECTRIC : 44.000
CALIBRATED CONDUCTIVITY : 6.600
PROBE OFFSET : 2.500 MM
CONVERSION FACTOR : 3.000
DIODE COMPRESSION PT : 76.0 MV
PROBE SENSITIVITY : 0.580 0.580 0.580 MV/(MW/CM^2)
AMPLIFIER GAINS : 20.00 20.00 20.00
CHAN. OFFSET (MV) : -5.07 3.28 -0.78

SAMPLE:

RATE: 6000 SAMPLES/SEC
COUNT: 1000 SAMPLES
NIDAQ GAIN: 5
SCAN TIME: 166.7 MSEC

COMMENTS:

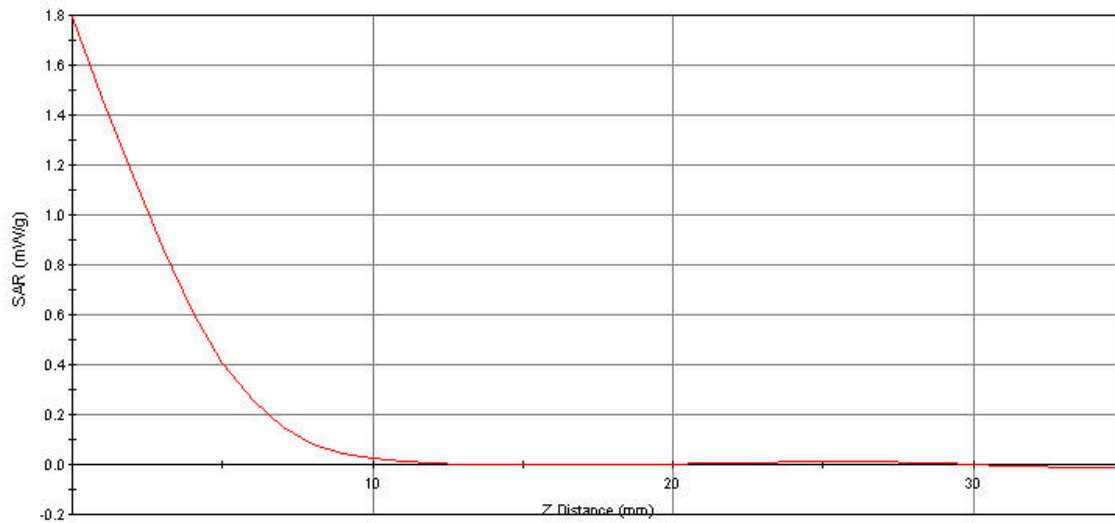
FRONT 10MM, LCD OUT

AREA SCAN - MAX LOCAL SAR VALUE AT X=13.0 Y=57.0 = 0.46 W/KG
ZOOM SCAN - MAX LOCAL SAR VALUE AT X=11.0 Y=57.0 Z=0.0 = 1.79 W/KG
MAX 1G SAR AT X=13.0 Y=58.0 Z=0.0 = 0.65 W/KG
MAX 10G SAR AT X=12.0 Y=59.0 Z=0.0 = 0.24 W/KG



Z AXIS SCAN

SAR - Z Axis
at Hotspot x:11.0 y:57.0



GRAPH 5

Direct Contact SAR (10g)
Left Hand Side
Distance 0 mm
Mid Channel
Frequency: 5260 MHz
Duty Cycle 1



Date	Dielectric Constant ϵ_r	Conductivity σ [S/m]	Probe Con/F	Tissue Temp (°C)	10g SAR (W/kg)	Power Drift
29/05/03	44.0	6.60	3.0	21	0.42	0

GRAPH 6

Body SAR (1g)
Left Hand Side
Distance 0 mm
Mid Channel
Frequency: 5260 MHz
Duty Cycle 1



Date	Dielectric Constant ϵ_r	Conductivity σ [S/m]	Probe Con/F	Tissue Temp ($^{\circ}\text{C}$)	1g SAR (W/kg)	Power Drift
29/05/03	44.0	6.60	3.0	21	1.32	0

GRAPH 7

Direct Contact SAR (10g)
Right Hand Side
Distance 10 mm
Mid Channel
Frequency: 5260 MHz
Duty Cycle 1



Date	Dielectric Constant ϵ_r	Conductivity σ [S/m]	Probe Con/F	Tissue Temp (°C)	10g SAR (W/kg)	Power Drift
29/05/03	44.0	6.60	3.0	21	0.20	0

GRAPH 8

Body SAR (1g)
Right Hand Side
Distance 10 mm
Mid Channel
Frequency: 5260 MHz
Duty Cycle 1



Date	Dielectric Constant ϵ_r	Conductivity σ [S/m]	Probe Con/F	Tissue Temp (°C)	1g SAR (W/kg)	Power Drift
29/05/03	44.0	6.60	3.0	21	0.56	0

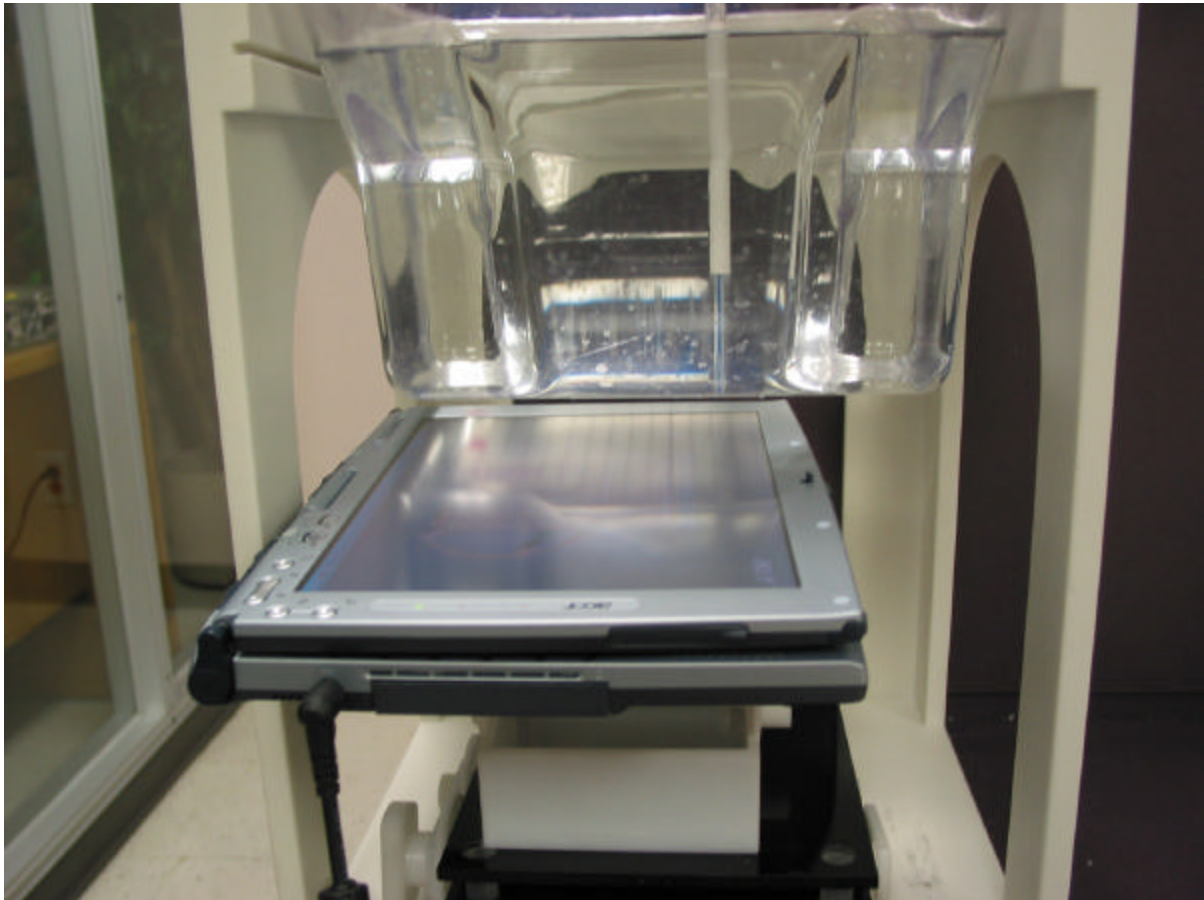
APPENDIX B

SETUP PICTURES



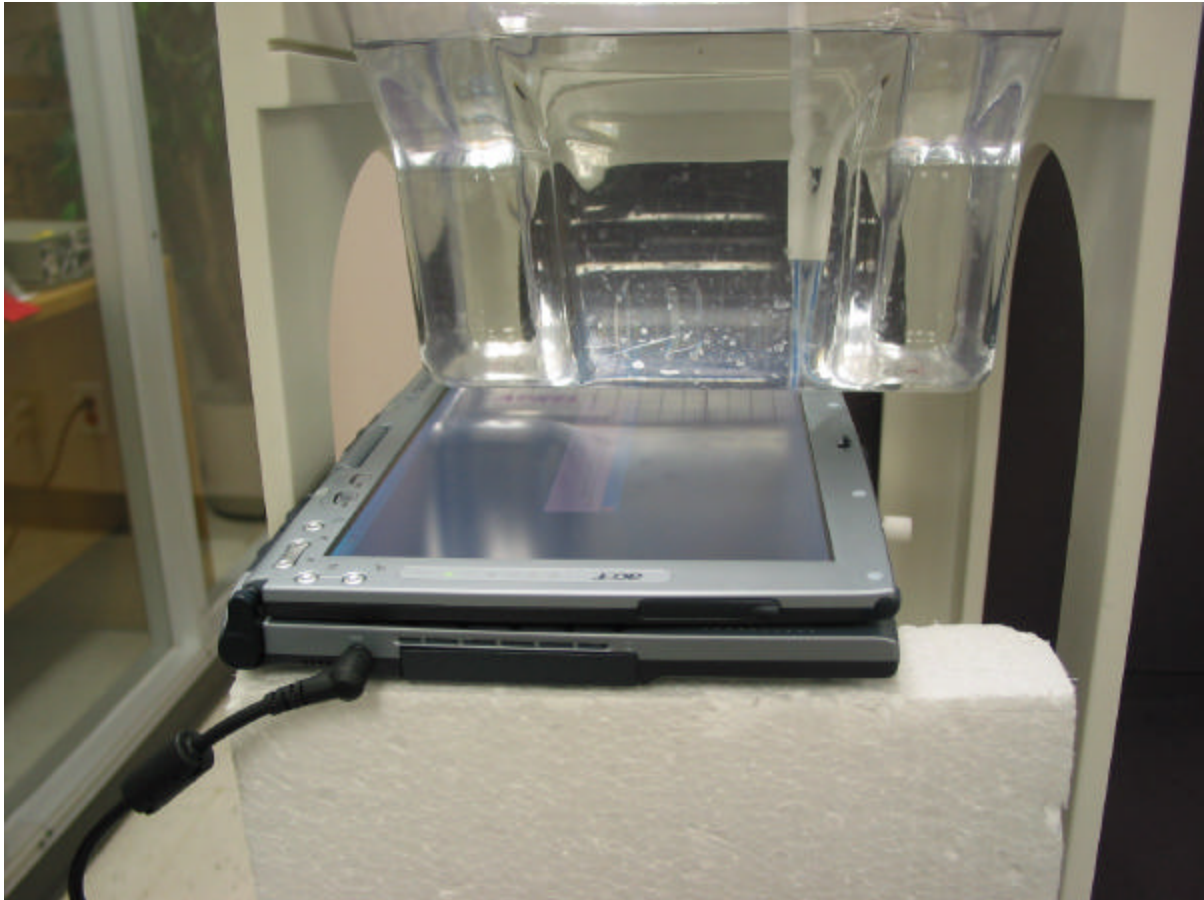
PICTURE 1

Ne-Web Antenna
DUI in Keyboard Up Position Tablet Mode



PICTURE 2

Ne-Web Antenna
DUI in Keyboard Up Position Tablet Mode



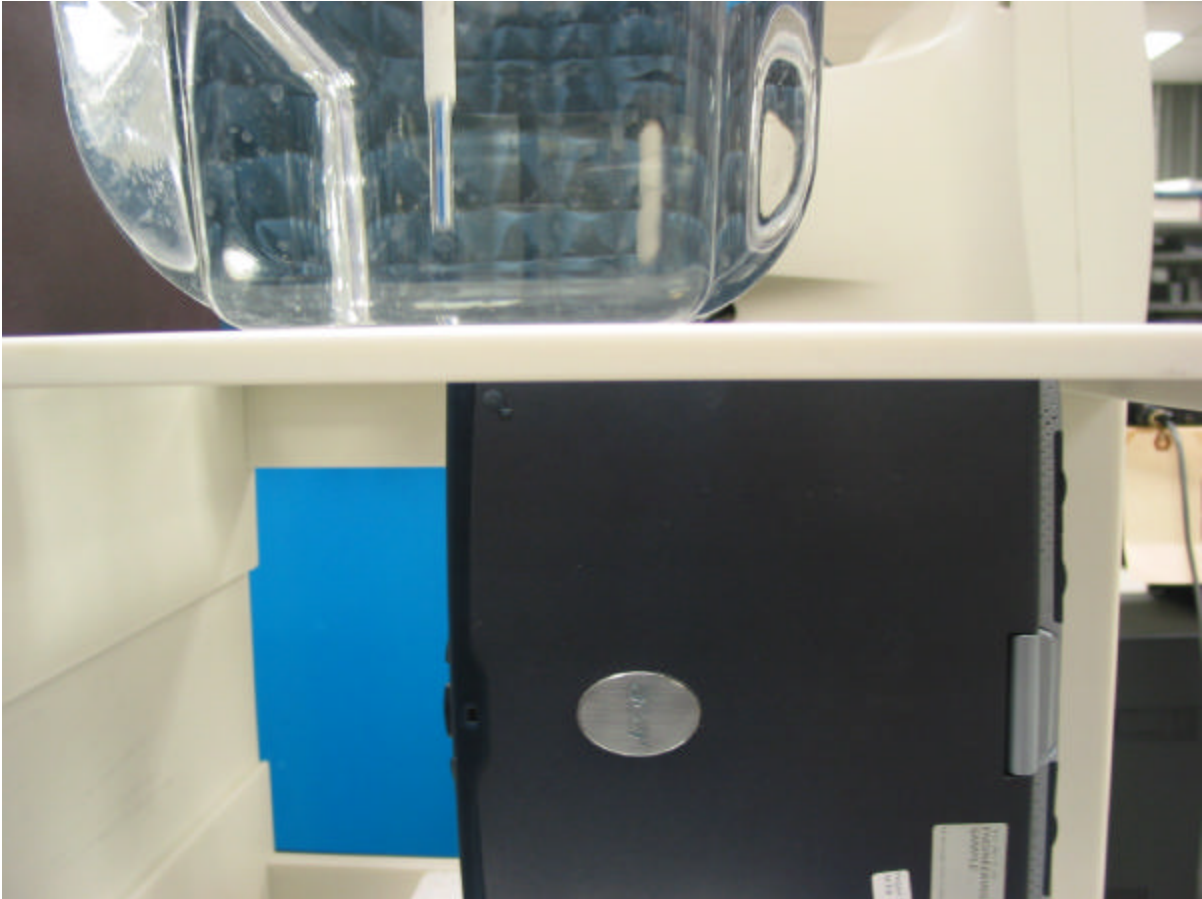
PICTURE 3

Ne-Web Antenna
DUI Keyboard Down



PICTURE 4

Ne-Web Antenna
DUI LHS



PICTURE 5

Newweb Antenna
DUI RHS

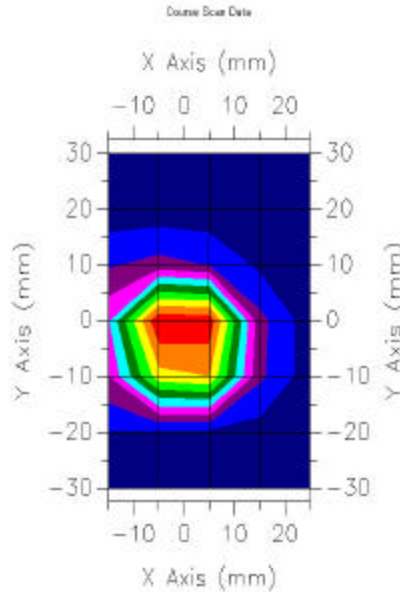


Appendix C

Validation Scan Results



VALIDATION SCAN



Date: 29th May 2003
 Frequency: 5240 MHz
 Tissue Type: Muscle
 Epsilon: 44.0
 Sigma: 6.60
 Tissue Calibration Date: 29th May 2003
 Conversion Factor: 3.0
 Input Power to Dipole: 0.1 W (Normalized to 1W)
 Duty Cycle: 1
 Distance from Dipole to Tissue: 10 mm
 Tissue Temperature: 21°C
 Tissue Depth: 15 cm

Measured 1 Gram SAR (W/Kg)	Target 1 Gram SAR (W/Kg)	Delta (%)
115.8	119.2	+/-2.0

Measured 10 Gram SAR (W/Kg)	Target 10 Gram SAR (W/Kg)	Delta (%)
33.4	35.3	+/-5

Appendix d: Uncertainty Budget

Intel dual band Mini PCI Type 3B Wireless LAN Adapter model WM3B2100A located inside the Acer Travelmate laptop C110

Source of Uncertainty	Description (Annex)	Tolerance Value	Probability Distribution	Divisor	c_i^{-1} (1-g)	c_i^{-1} (10-g)	Standard Uncertainty (1-g)	Standard Uncertainty (10-g)	v_i^2 or v_{eff}
Measurement System									
Probe Calibration	E1.1	3.5	normal	1	1	1	3.5	3.5	
Axial Isotropy	E1.2	3.7	rectangular	3	$(1-cp)^{1/2}$	$(1-cp)/2$	1.5	1.5	
Hemispherical Isotropy	E1.2	10.9	rectangular	3	cp	cp	4.4	4.4	
Boundary Effect	E1.3	1.0	rectangular	3	1	1	0.6	0.6	
Linearity	E1.4	4.7	rectangular	3	1	1	2.7	2.7	
Detection Limit	E1.5	1.0	rectangular	3	1	1	0.6	0.6	
Readout Electronics	E1.6	1.0	normal	1	1	1	1.0	1.0	
Response Time	E1.7	0.8	rectangular	3	1	1	0.5	0.5	
Integration Time	E1.8	1.7	rectangular	3	1	1	1.0	1.0	
RF Ambient Condition	E5.1	3.0	rectangular	3	1	1	1.7	1.7	
Probe Positioner Mech. Restrictions	E5.2	0.4	rectangular	3	1	1	0.2	0.2	
Probe Positioning with respect to Phantom Shell	E5.3	2.9	rectangular	3	1	1	1.7	1.7	
Extrapolation and Integration	E4.2	3.7	rectangular	3	1	1	2.1	2.1	
Test Sample Positioning	E3.1.3	4.0	normal	1	1	1	4.0	4.0	11
Device Holder Uncertainty	E3.1.2	2.0	normal	1	1	1	2.0	2.0	8
Drift of Output Power	Section 5.6.2	0.0	rectangular	3	1	1	0.0	0.0	
Phantom and Setup									
Phantom Uncertainty (shape and thickness tolerance)	E2.1	3.4	rectangular	3	1	1	2.0	2.0	
Liquid Conductivity (target)	E2.2	13.0	rectangular	3	0.7	0.5	5.3	3.8	
Liquid Conductivity (meas.)	E2.2	2.0	rectangular	3	0.7	0.5	0.8	0.6	
Liquid Permittivity (target)	E2.2	2.0	rectangular	3	0.6	0.5	0.7	0.6	
Liquid Permittivity (meas.)	E2.2	2.0	rectangular	3	0.6	0.5	0.7	0.6	
Combined Uncertainty			RSS				10.3	9.5	
Combined Uncertainty (coverage factor = 2)			Normal (k=2)				20.6	19.1	



Appendix E

Probe Calibration Certificate



NCL CALIBRATION LABORATORIES

Calibration File No.: CP-255

C E R T I F I C A T E O F C A L I B R A T I O N

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 5240 MHz

Manufacturer: APREL Laboratories

Model No.: E-010

Serial No.: 163

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

Project No: Internal Project

Calibrated: 2 December 2002

Released on: 2 December 2002

In accordance with ISO-17025 this calibration certificate is only valid when presented or reproduced with the full
calibration report.

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

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



INTRODUCTION

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-010 168.

REFERENCES

SSI/DRB-TP-D01-032 E-Field Probe Calibration Procedure
IEEE P-1528 *DRAFT* "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 163 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory: 21.5 °C +/- 0.5 °C
Temperature of the Tissue: 20.5 °C +/- 0.5 °C



CALIBRATION RESULTS SUMMARY

Probe Type: E-Field Probe E-010

Serial Number: 163

Frequency: 5240 MHz

Sensor Offset: 3.0 mm

Sensor Length: 3.0 mm

Tip Enclosure: Glass*

Tip Diameter: 7 mm

Tip Length: 40 mm

Total Length: 290 mm

*Resistive to recommended tissue recipes per IEEE-P1528

SENSITIVITY IN AIR

Channel X: $0.58 \text{ } \mu\text{V}/(\text{V}/\text{m})^2$

Channel Y: $0.58 \text{ } \mu\text{V}/(\text{V}/\text{m})^2$

Channel Z: $0.58 \text{ } \mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression Point: 76 mV



SENSITIVITY IN BODY TISSUE

Frequency: 5240 MHz

Epsilon: 45.0 (+/-10%) **Sigma:** 5.85 S/m (+/-10%)

ConvF

Channel X: 3.0

Channel Y: 3.0

Channel Z: 3.0

Tissue sensitivity values were calculated using a load impedance of 5 M Ω .

Boundary Effect:

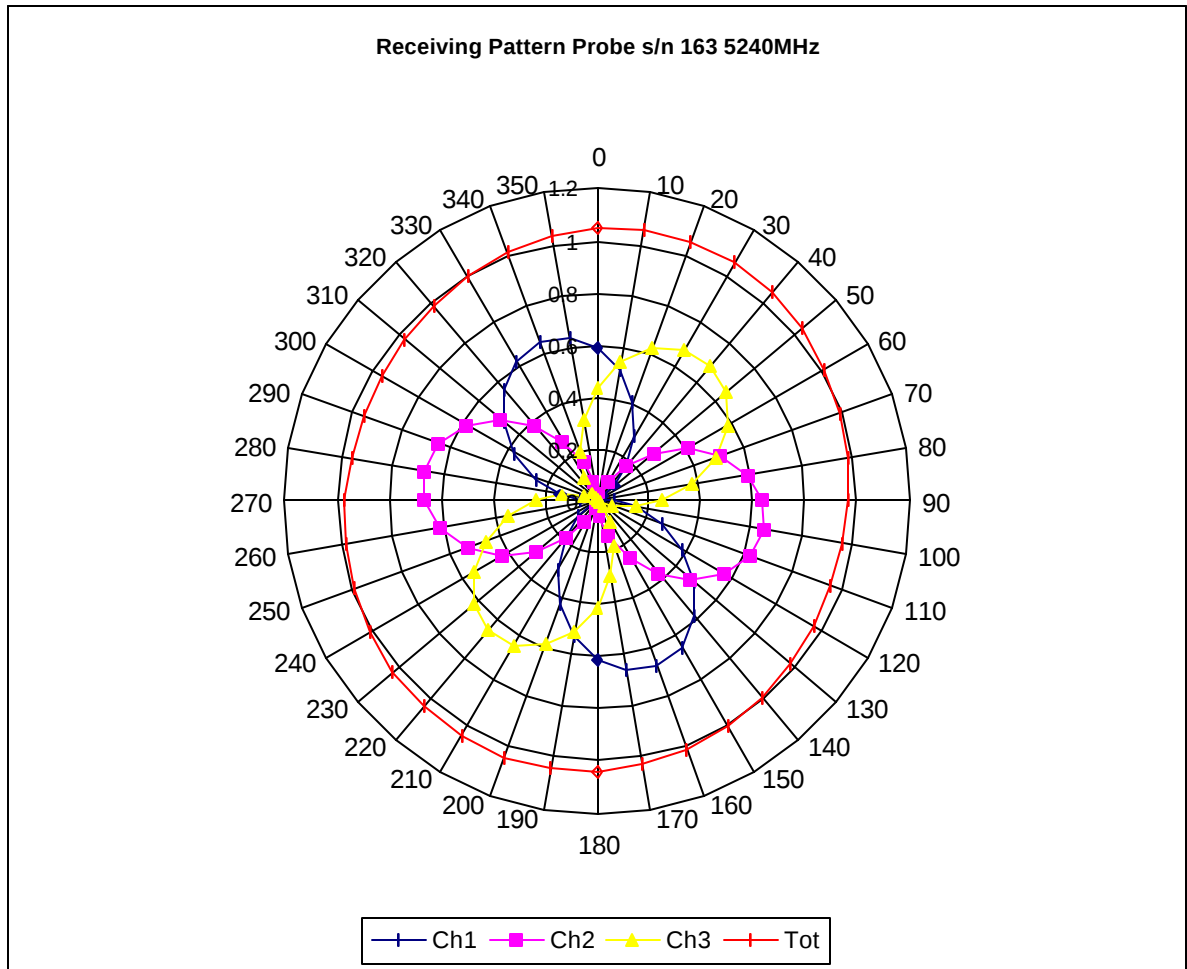
Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.6mm.

Spatial Resolution:

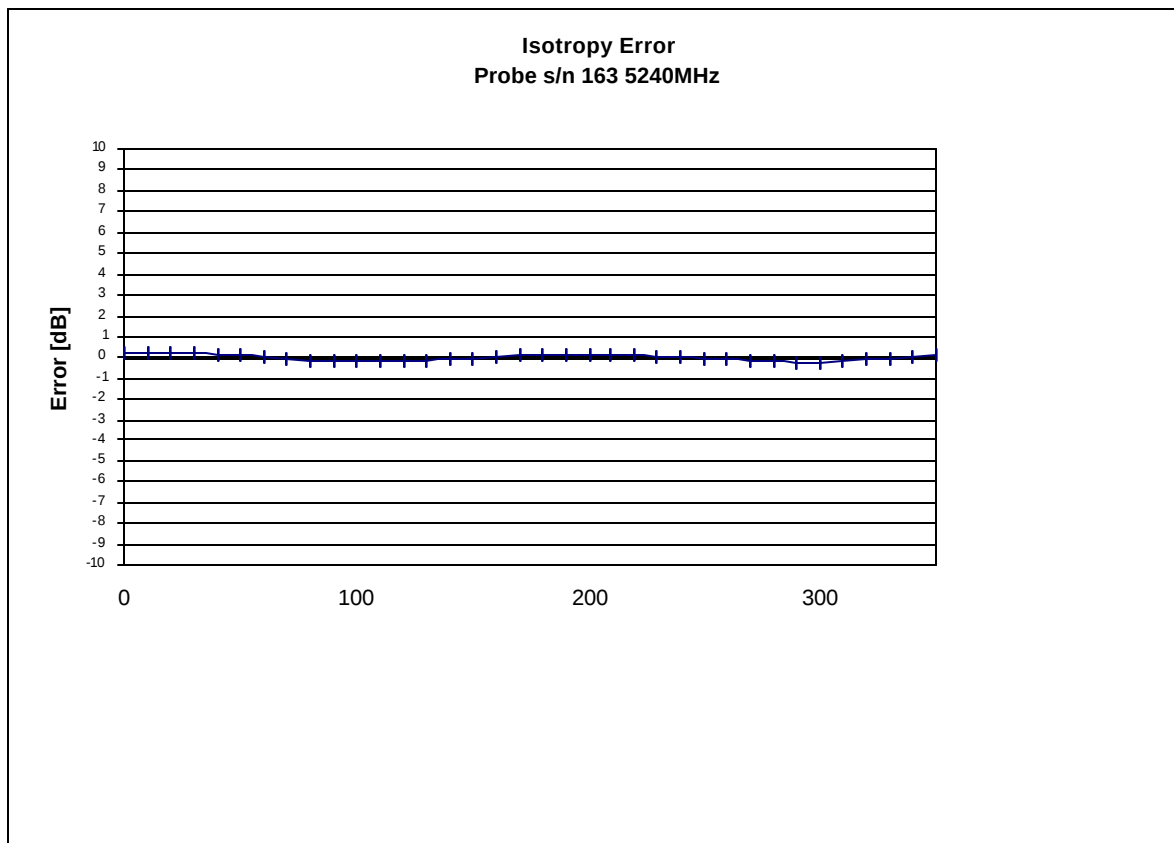
The measured probe tip diameter is 7 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

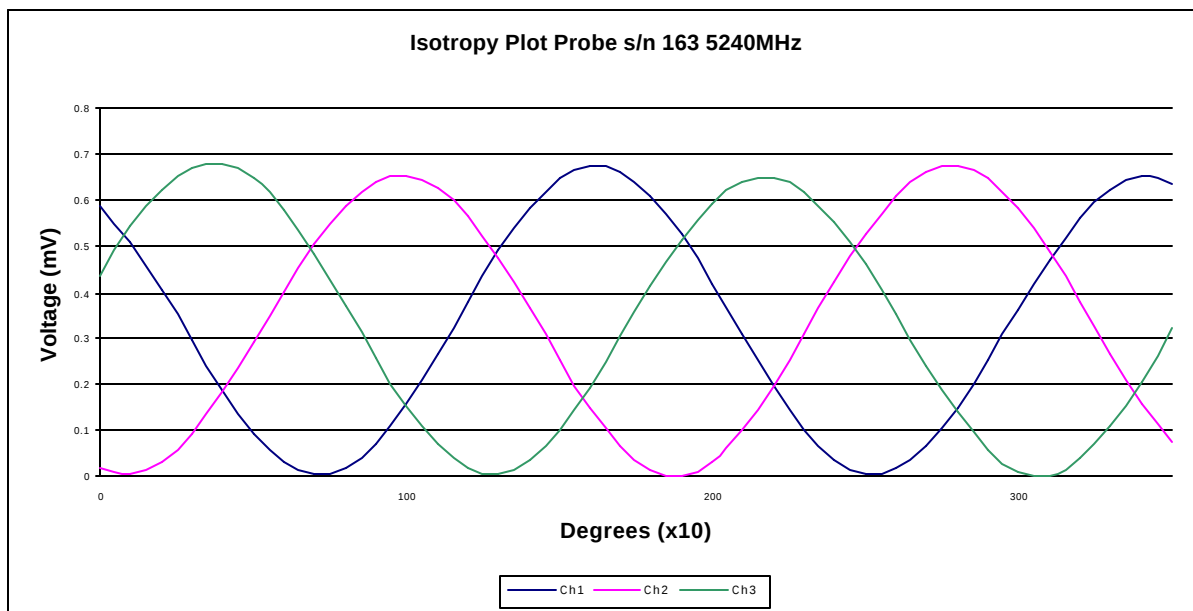


RECEIVING PATTERN 5240 MHZ (AIR)



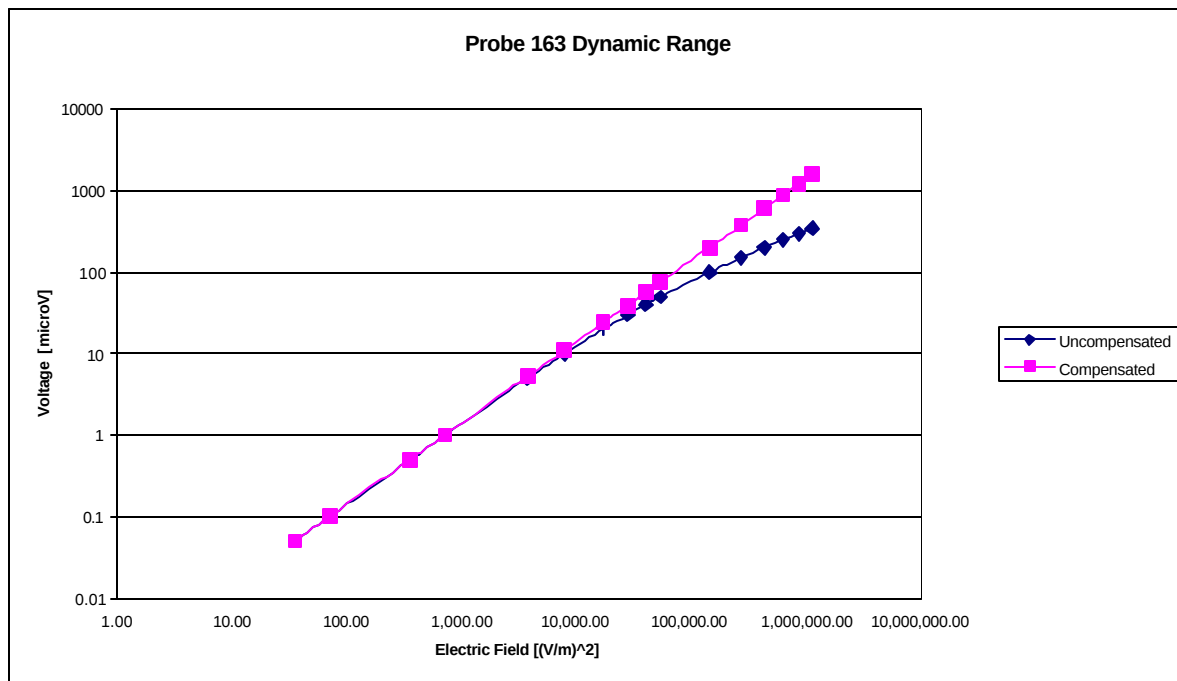
ISOTROPY ERROR 5240 MHZ (AIR)





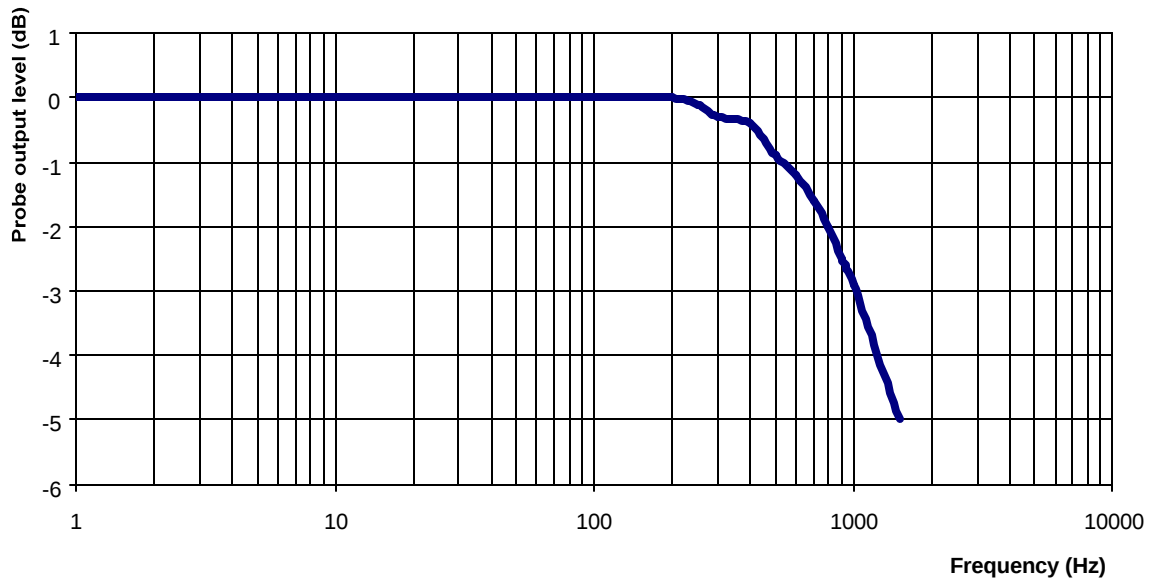
Isotropy: 0.12 dB

DYNAMIC RANGE



Video Bandwidth

Probe Frequency Characteristics



Video Bandwidth at 500 Hz: 1 dB
Video Bandwidth at 1.02 KHz: 3 dB

CONVERSION FACTOR UNCERTAINTY ASSESSMENT

Frequency: 5240MHz

Epsilon: 45.0 (+/-5%) **Sigma:** 5.85 S/m (+/-10%)

ConvF

Channel X: 3.0 7%(K=2)

Channel Y: 3.0 7%(K=2)

Channel Z: 3.0 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 2.6MM THE EVALUATED UNCERTAINTY (**INCREASE IN THE PROBE SENSITIVITY**) IS LESS THAN 2%.



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 2003.



Appendix F

Dipole Calibration Certificate



NCL CALIBRATION LABORATORIES

Calibration File No: DC-0254

Project Number: Internal

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.

APREL Validation Dipole

Manufacturer: APREL Laboratories

Part number: D-5240-S-1

Frequency: 5.24 GHz

Serial No: 301460

Customer: APREL

Calibrated: 1 December 2002

Released on: 1 December 2002

Released By: _____

NCL CALIBRATION LABORATORIES

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CALIBRATION RESULTS SUMMARY

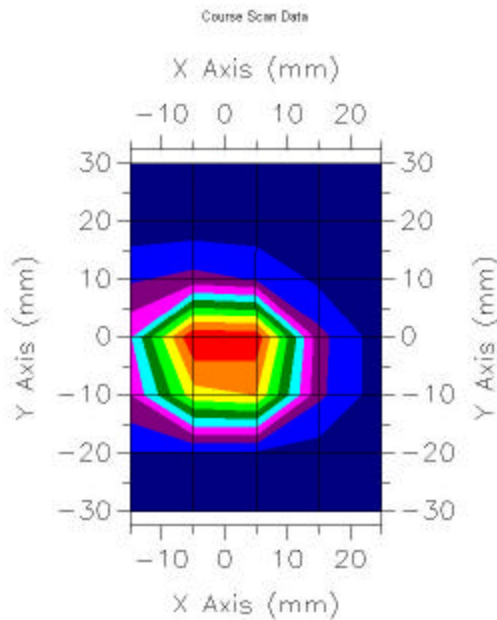
The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Electrical Specification

SWR: 1.21U
Return Loss: -17.9 dB
Impedance: 45.175

System Validation Results

Frequency	1 Gram	10 Gram
5240 GHz	119.2	35.3



INTRODUCTION

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018. The results contained within this report are for Validation Dipole 301532 at 5.8 GHz. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the IEEE mechanical specification. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALIDX-500, along with the APREL Reference E-010 130 MHz to 26 GHz E-Field Probe Serial Number 163.

REFERENCES

SSI-TP-018 Dipole Calibration Procedure
SSI-TP-016 Tissue Calibration Procedure
IEEE P-1528 *DRAFT* "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"

Conditions

Dipole 301532 was a new Dipole 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

