# Appendix A
# SAR Plots


51 Spectrum Way
Ottawa ON Canada K2R 1E6
www.aprel.com
info@aprel.com
Phone (613) 820-2730
Fax (613) 820-4161
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# SAR Test Report

Operator : Chen
Validation Date : 19-Apr-2009
Measurement Date : 19-Apr-2009
Starting Time : 19-Apr-2009 01:58:50 PM
End Time : 19-Apr-2009 02:12:49 PM
Scanning Time : 839 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 100 mm
Width : 150 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.105
Power Drift-Finish: 0.101
Power Drift (%) : -4.000

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 19-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56


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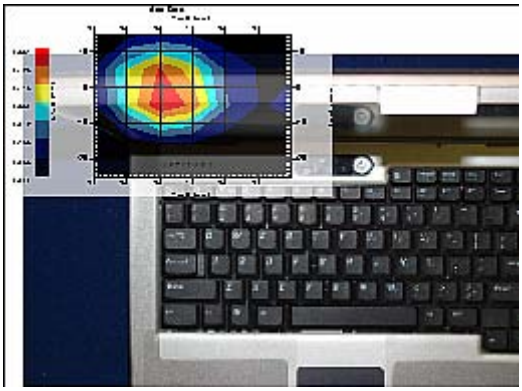
Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 19-Apr-2009
Set-up Time : 1:57:13 PM

Other Data
DUT Position : Touch
Separation : 0
Channel : Low - 2412



1 gram SAR value : 0.471 W/kg
Zoom Scan Peak SAR : 0.980


51 Spectrum Way
Ottawa ON Canada K2R 1E6
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info@aprel.com
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Fax (613) 820-4161
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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -20.8 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


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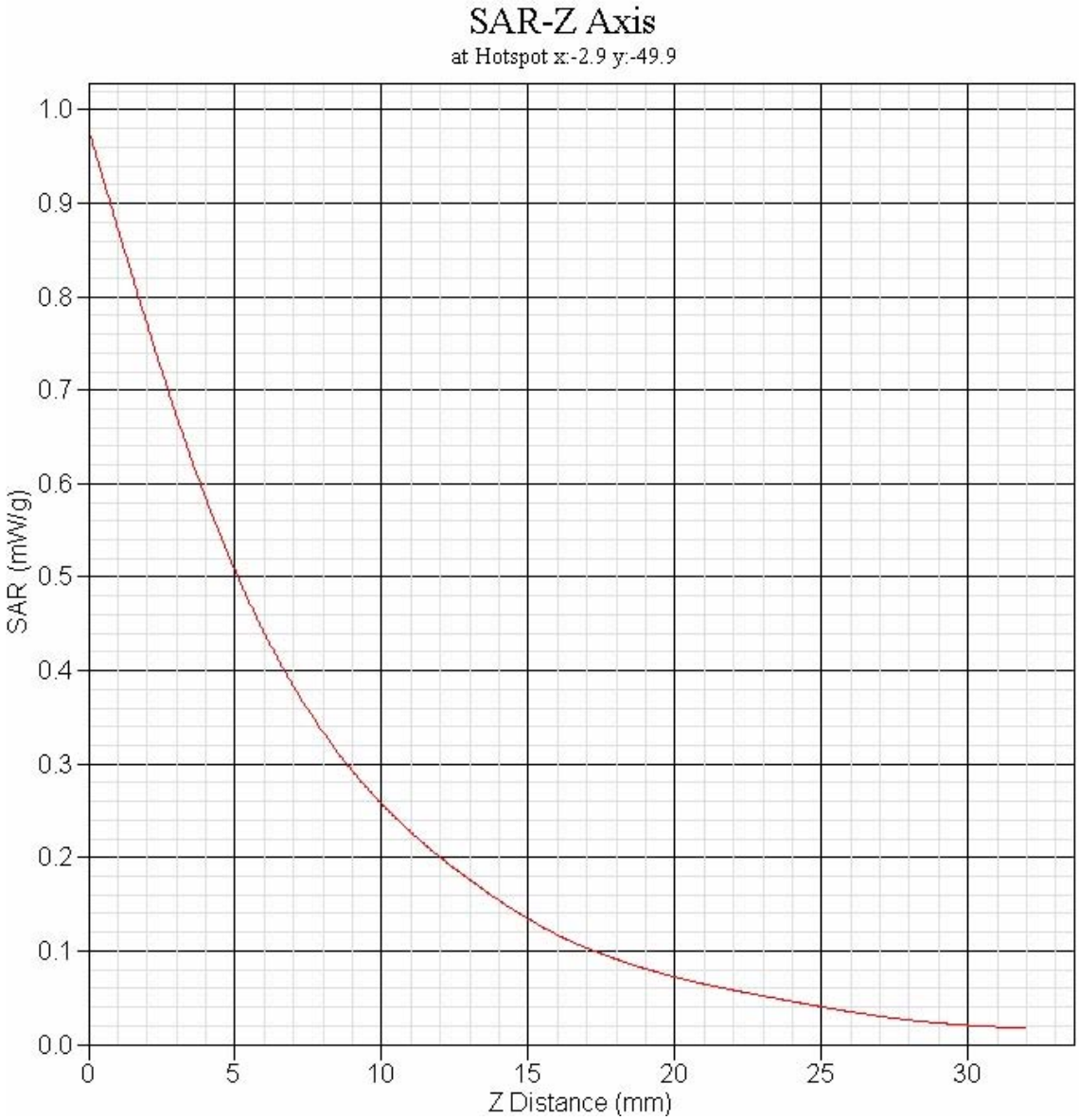



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# SAR Test Report

Operator : Chen
Validation Date : 19-Apr-2009
Measurement Date : 19-Apr-2009
Starting Time : 19-Apr-2009 01:58:50 PM
End Time : 19-Apr-2009 02:12:49 PM
Scanning Time : 839 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 100 mm
Width : 150 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.105
Power Drift-Finish: 0.103
Power Drift (%) : -2.000

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 19-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56


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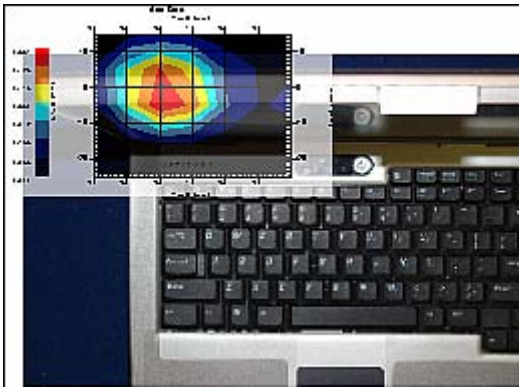
Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 19-Apr-2009
Set-up Time : 1:57:13 PM

Other Data
DUT Position : Touch
Separation : 0
Channel : Low - 2412



1 gram SAR value : 0.471 W/kg
Zoom Scan Peak SAR : 0.980


51 Spectrum Way
Ottawa ON Canada K2R 1E6
www.aprel.com
info@aprel.com
Phone (613) 820-2730
Fax (613) 820-4161
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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -20.8 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


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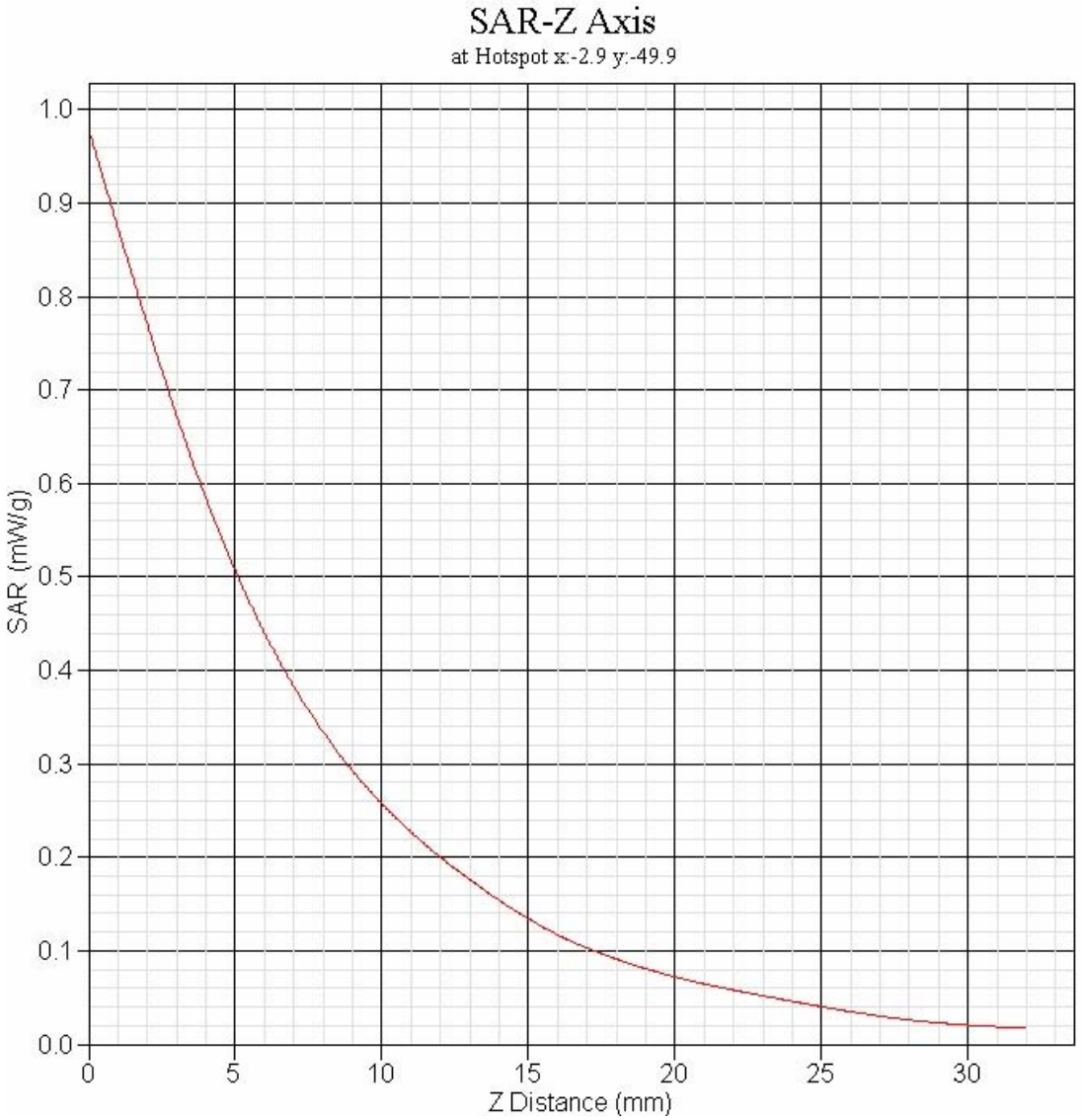



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# SAR Test Report

Operator : Chen
Validation Date : 19-Apr-2009
Measurement Date : 19-Apr-2009
Starting Time : 19-Apr-2009 03:19:31 PM
End Time : 19-Apr-2009 03:33:30 PM
Scanning Time : 839 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 100 mm
Width : 150 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.100
Power Drift-Finish: 0.100
Power Drift (%) : 0.000

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 19-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56


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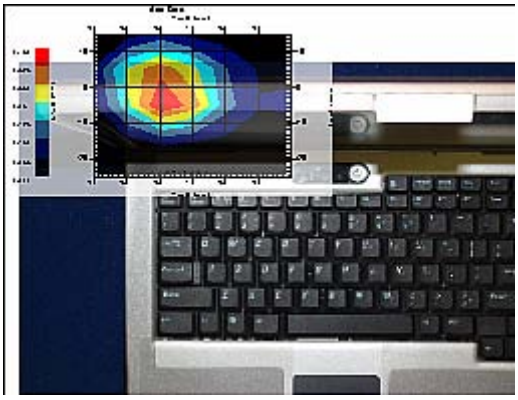
Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 19-Apr-2009
Set-up Time : 1:57:13 PM

Other Data
DUT Position : Touch
Separation : 0
Channel : Mid - 2437



1 gram SAR value : 0.412 W/kg
Zoom Scan Peak SAR : 0.850


51 Spectrum Way
Ottawa ON Canada K2R 1E6
www.aprel.com
info@aprel.com
Phone (613) 820-2730
Fax (613) 820-4161
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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -38.9 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


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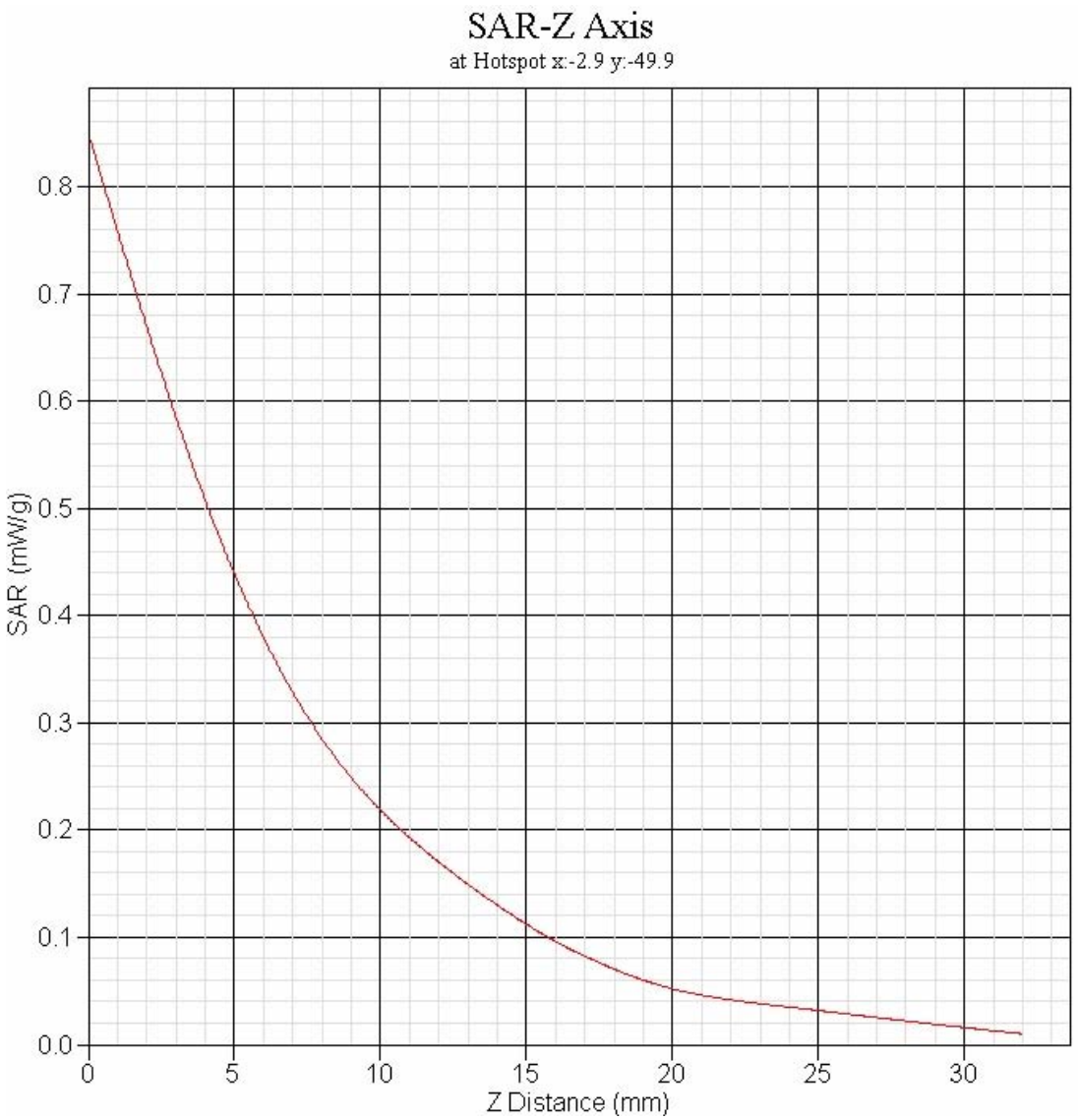



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Ottawa ON Canada K2R 1E6
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info@aprel.com
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# SAR Test Report

Operator : Chen
Validation Date : 20-Apr-2009
Measurement Date : 20-Apr-2009
Starting Time : 20-Apr-2009 11:00:48 AM
End Time : 20-Apr-2009 11:13:54 AM
Scanning Time : 786 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 100 mm
Width : 150 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.100
Power Drift-Finish: 0.099
Power Drift (%) : -1.000

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 20-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 20-Apr-2009
Set-up Time : 10:41:12 AM

Other Data
DUT Position : Touch
Separation : 0
Channel : Mid - 2437


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Ottawa ON Canada K2R 1E6
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info@aprel.com
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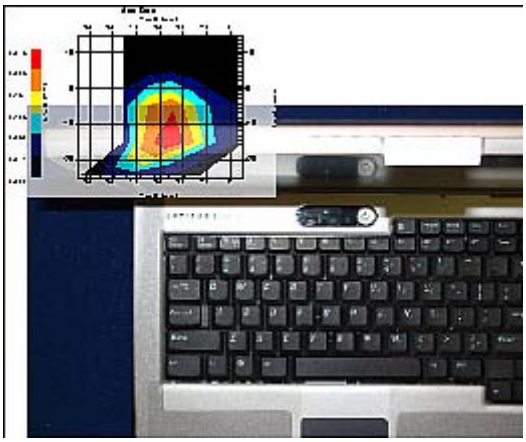

1 gram SAR value : 0.207 W/kg
Zoom Scan Peak SAR : 0.430


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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -79.2 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


51 Spectrum Way
Ottawa ON Canada K2R 1E6
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info@aprel.com
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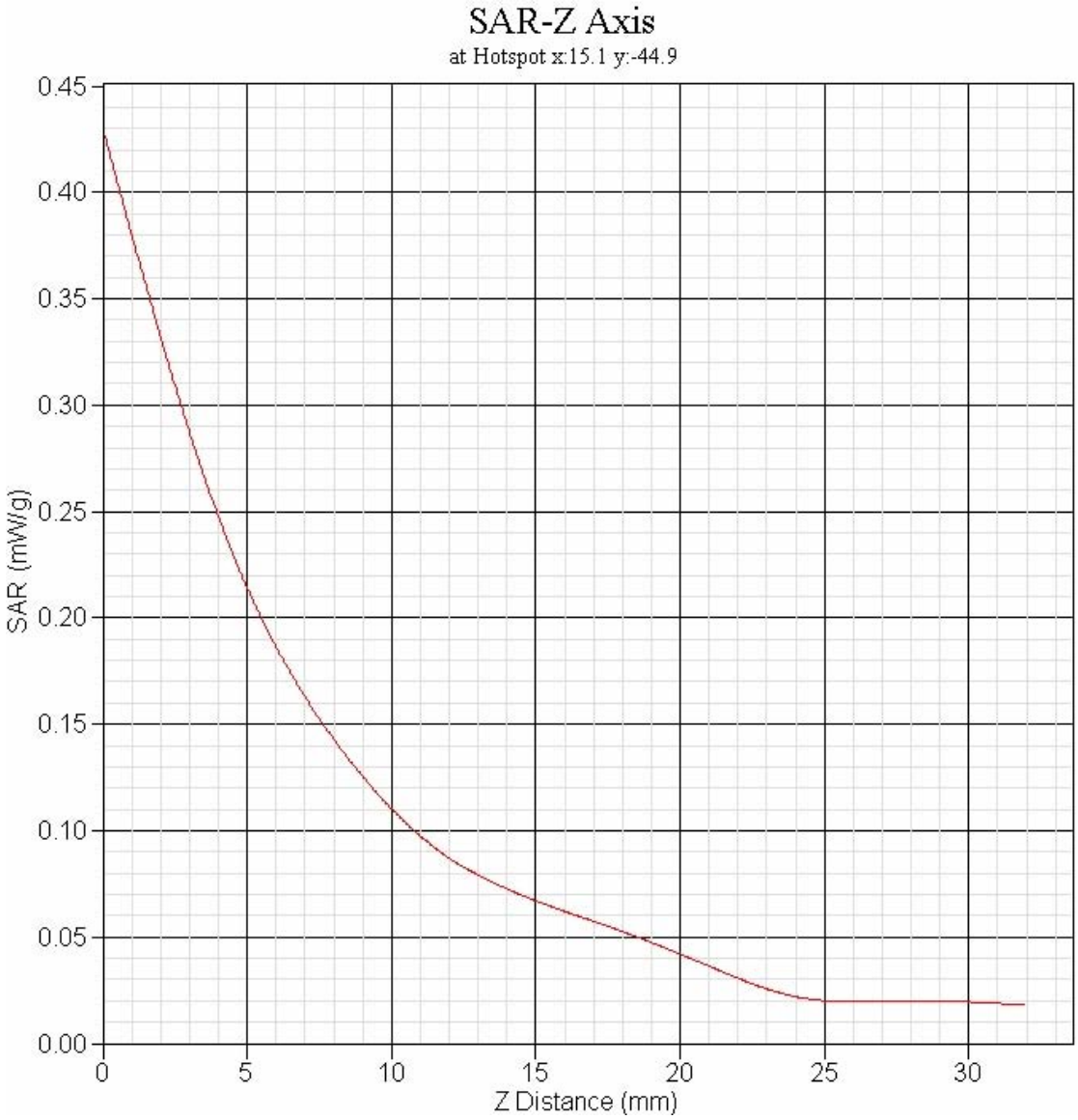



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# SAR Test Report

Operator : Chen
Validation Date : 19-Apr-2009
Measurement Date : 19-Apr-2009
Starting Time : 19-Apr-2009 03:44:09 PM
End Time : 19-Apr-2009 03:58:09 PM
Scanning Time : 840 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 100 mm
Width : 150 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.100
Power Drift-Finish: 0.101
Power Drift (%) : 1.000

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 19-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56


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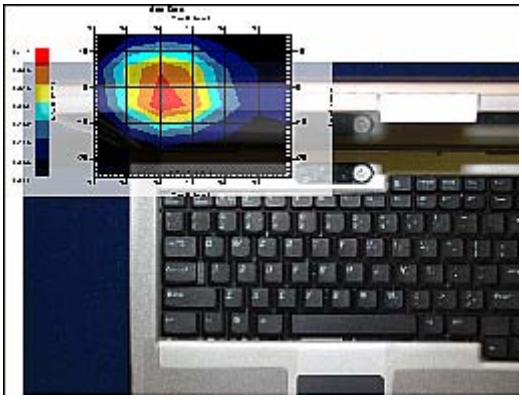
Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 19-Apr-2009
Set-up Time : 1:57:13 PM

Other Data
DUT Position : Touch
Separation : 0
Channel : High - 2462



1 gram SAR value : 0.392 W/kg
Zoom Scan Peak SAR : 0.820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Ottawa ON Canada K2R 1E6
www.aprel.com
info@aprel.com
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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -38.3 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


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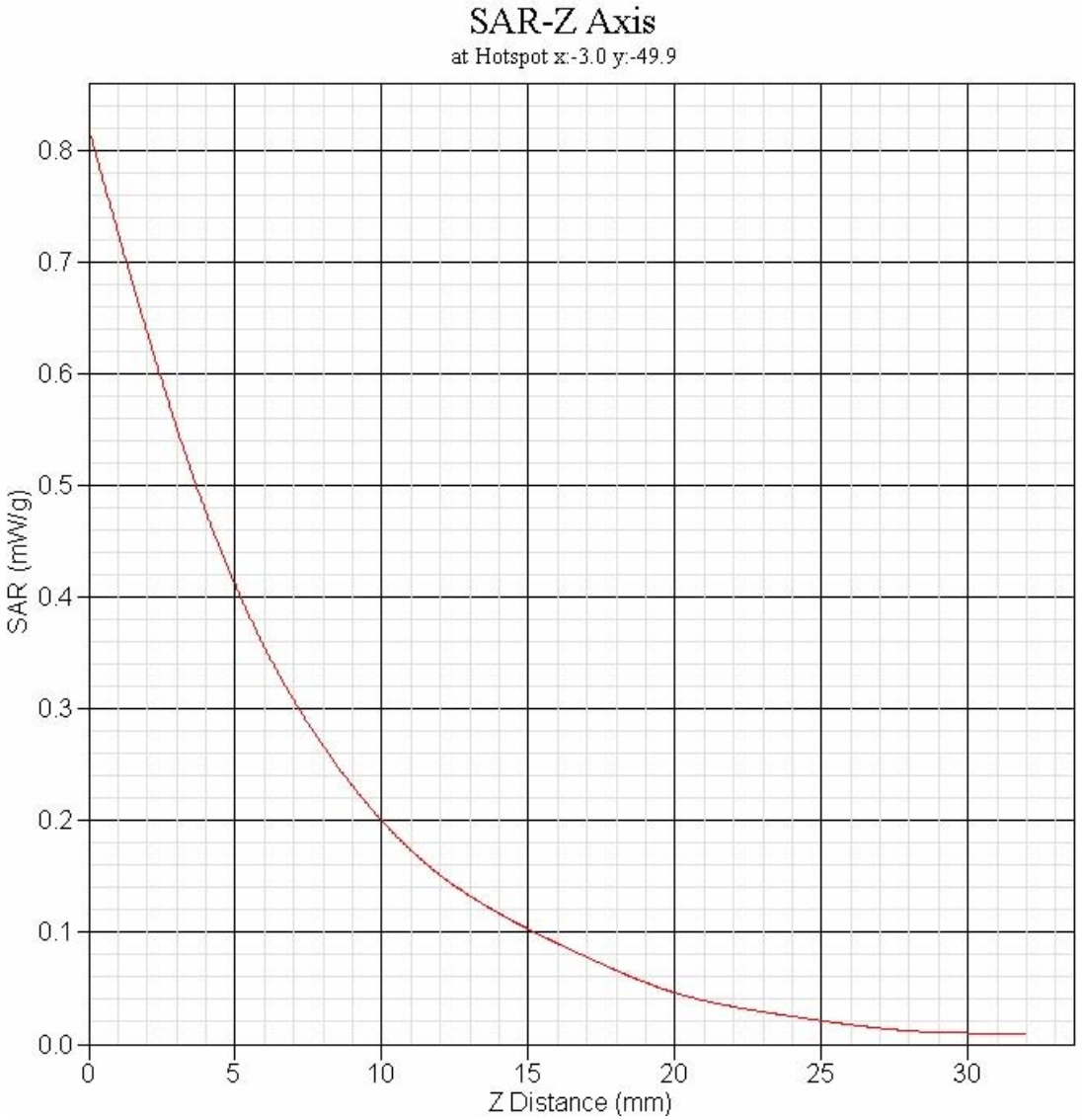



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info@aprel.com
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# SAR Test Report

Operator : Chen
Validation Date : 20-Apr-2009
Measurement Date : 20-Apr-2009
Starting Time : 20-Apr-2009 11:19:09 AM
End Time : 20-Apr-2009 11:32:15 AM
Scanning Time : 786 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 100 mm
Width : 150 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.122
Power Drift-Finish: 0.126
Power Drift (%) : 2.544

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 20-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56


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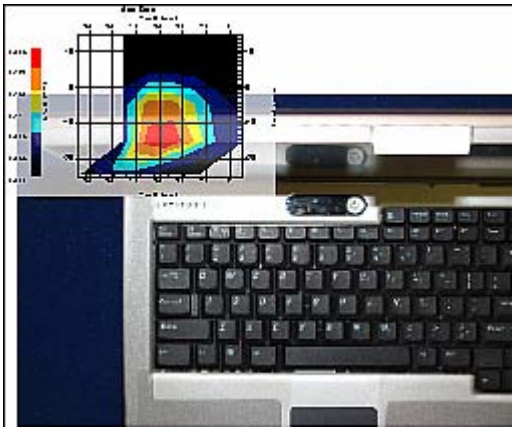
Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 20-Apr-2009
Set-up Time : 10:41:12 AM

Other Data
DUT Position : Touch
Separation : 0
Channel : High - 2462



1 gram SAR value : 0.193 W/kg
Zoom Scan Peak SAR : 0.410


51 Spectrum Way
Ottawa ON Canada K2R 1E6
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info@aprel.com
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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -74.2 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


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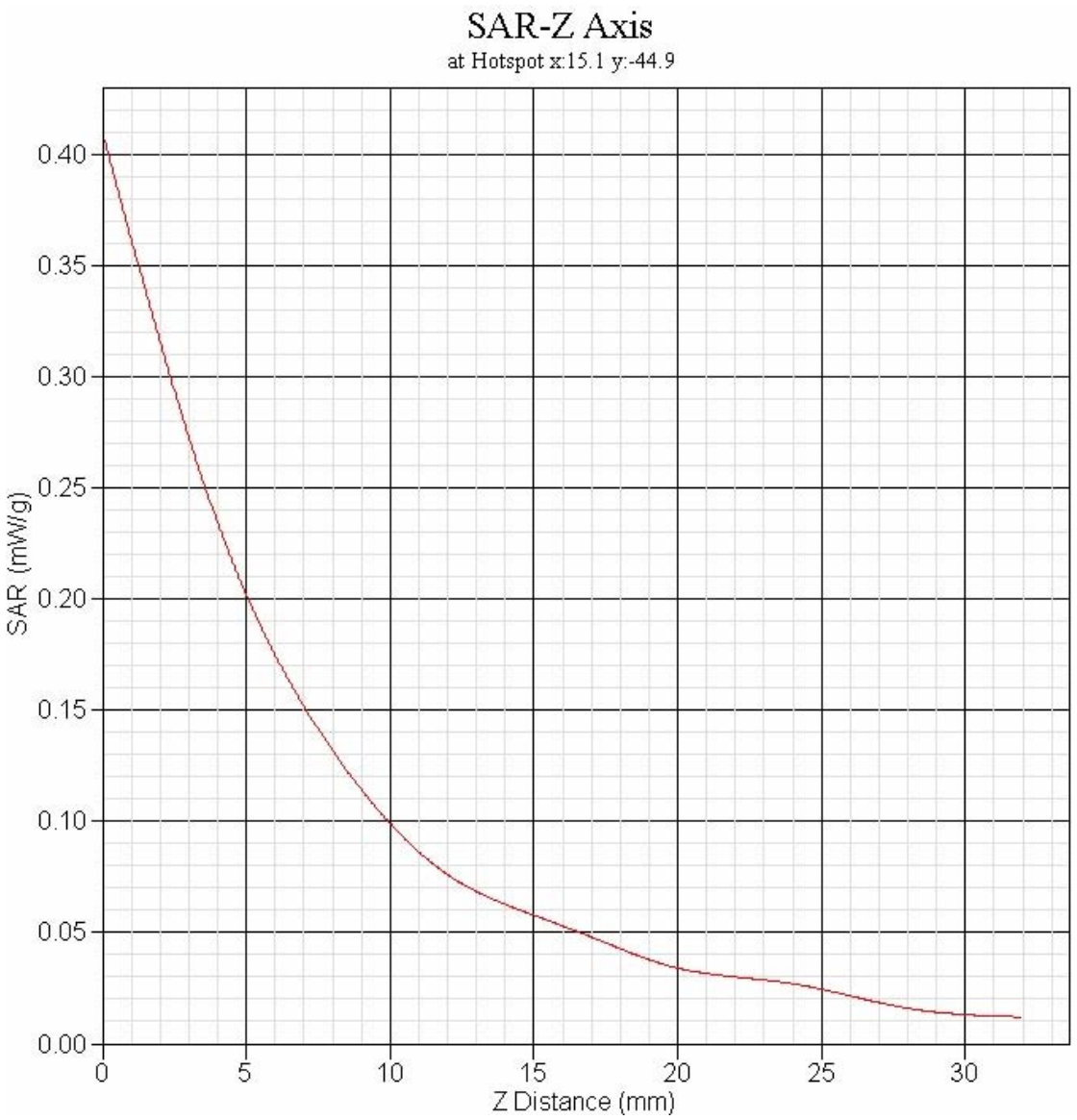



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# SAR Test Report

Operator : Chen
Validation Date : 20-Apr-2009
Measurement Date : 20-Apr-2009
Starting Time : 20-Apr-2009 12:50:33 PM
End Time : 20-Apr-2009 01:03:39 PM
Scanning Time : 786 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 150 mm
Width : 120 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.100
Power Drift-Finish: 0.095
Power Drift (%) : -4.461

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 20-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56


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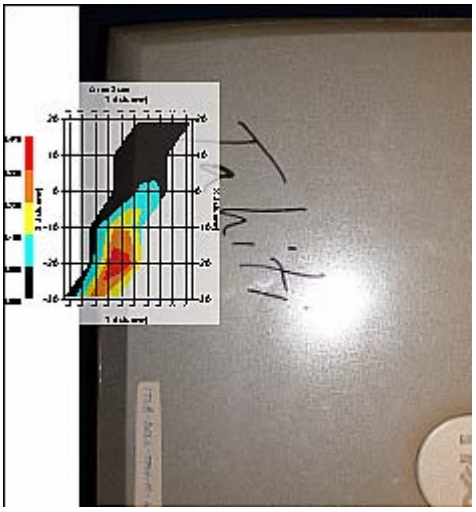
Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 20-Apr-2009
Set-up Time : 10:41:12 AM

Other Data
DUT Position : Touch
Separation : 0
Channel : Low - 2412



1 gram SAR value : 0.402 W/kg
Zoom Scan Peak SAR : 0.850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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -94.5 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


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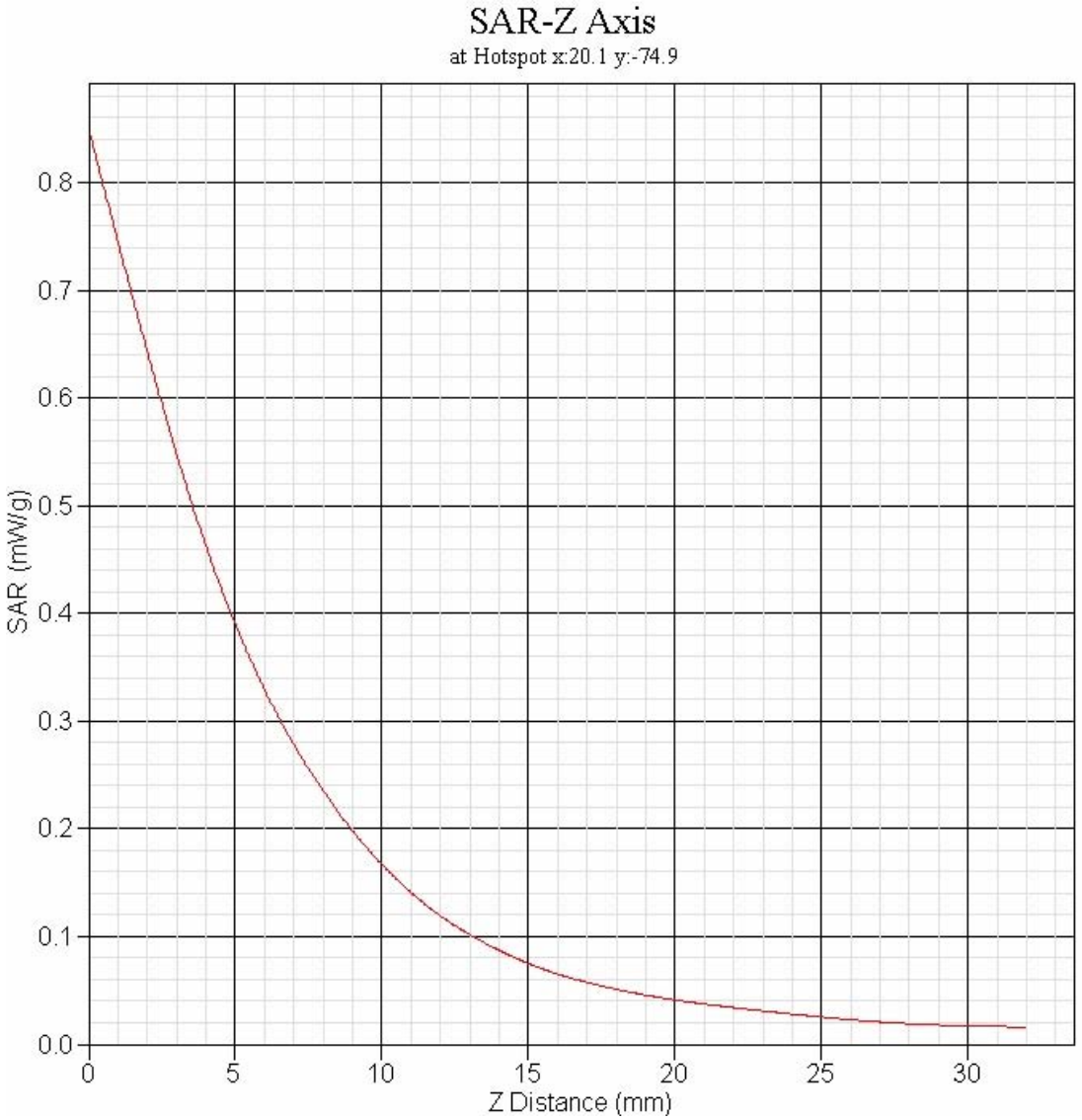



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# SAR Test Report

Operator : Chen
Validation Date : 20-Apr-2009
Measurement Date : 20-Apr-2009
Starting Time : 20-Apr-2009 01:20:37 PM
End Time : 20-Apr-2009 01:33:45 PM
Scanning Time : 788 secs

Product Data
Device Name : Dell_Tahiti_Phycomp
Serial No. : N/A
Type : Other
Model : Latitude D510
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.05 W
Drift Time : 0 min(s)
Length : 150 mm
Width : 120 mm
Depth : 30.4 mm
Antenna Type : Internal
Power Drift-Start : 0.100
Power Drift-Finish: 0.095
Power Drift (%) : -4.244

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size : 280 x 280 x 200
Serial No. : User Define
Location : Center
Description : User Define Data

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450 MHz
Calibration Date : 20-Apr-2005
Temperature : 21 °C
Ambient Temp. : 22 °C
Humidity : 50 RH%
Epsilon : 54.12 F/m
Sigma : 2.01 S/m
Density : 1000 kg/cu. m

Probe Data
Name : APREL Probe 212
Model : E020
Type : E-Field Triangle
Serial No. : 212
Calibration Date : 27-Dec-2004
Frequency : 2450 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95 mV
Offset : 1.56


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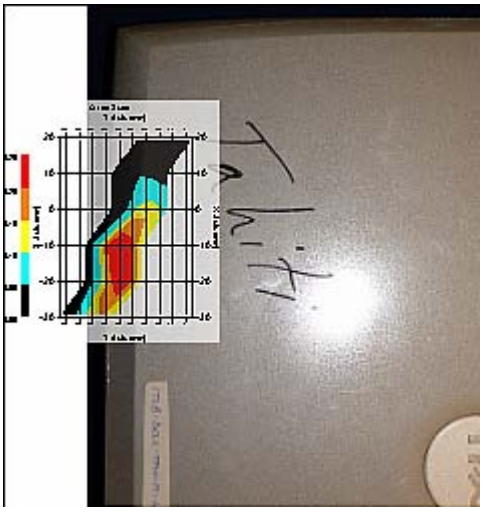
Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21 °C
Ambient Temp. : 22°C
Set-up Date : 20-Apr-2009
Set-up Time : 10:41:12 AM

Other Data
DUT Position : Touch
Separation : 0
Channel : Low - 2412



1 gram SAR value : 0.211 W/kg
Zoom Scan Peak SAR : 0.420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www.aprel.com
info@aprel.com
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**Exposure Assessment Measurement Uncertainty**

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | √3 | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | √3 | √cp | √cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | √3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | √3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | √3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | √3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | √3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | √3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | -95.2 | rectangular | √3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | √3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | √3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.2 | rectangular | √3 | 0.7 | 0.5 | 0.1 | 0.1 |
| Liquid Permittivity(target) | 2.0 | rectangular | √3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | √3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |


51 Spectrum Way
Ottawa ON Canada K2R 1E6
www.aprel.com
info@aprel.com
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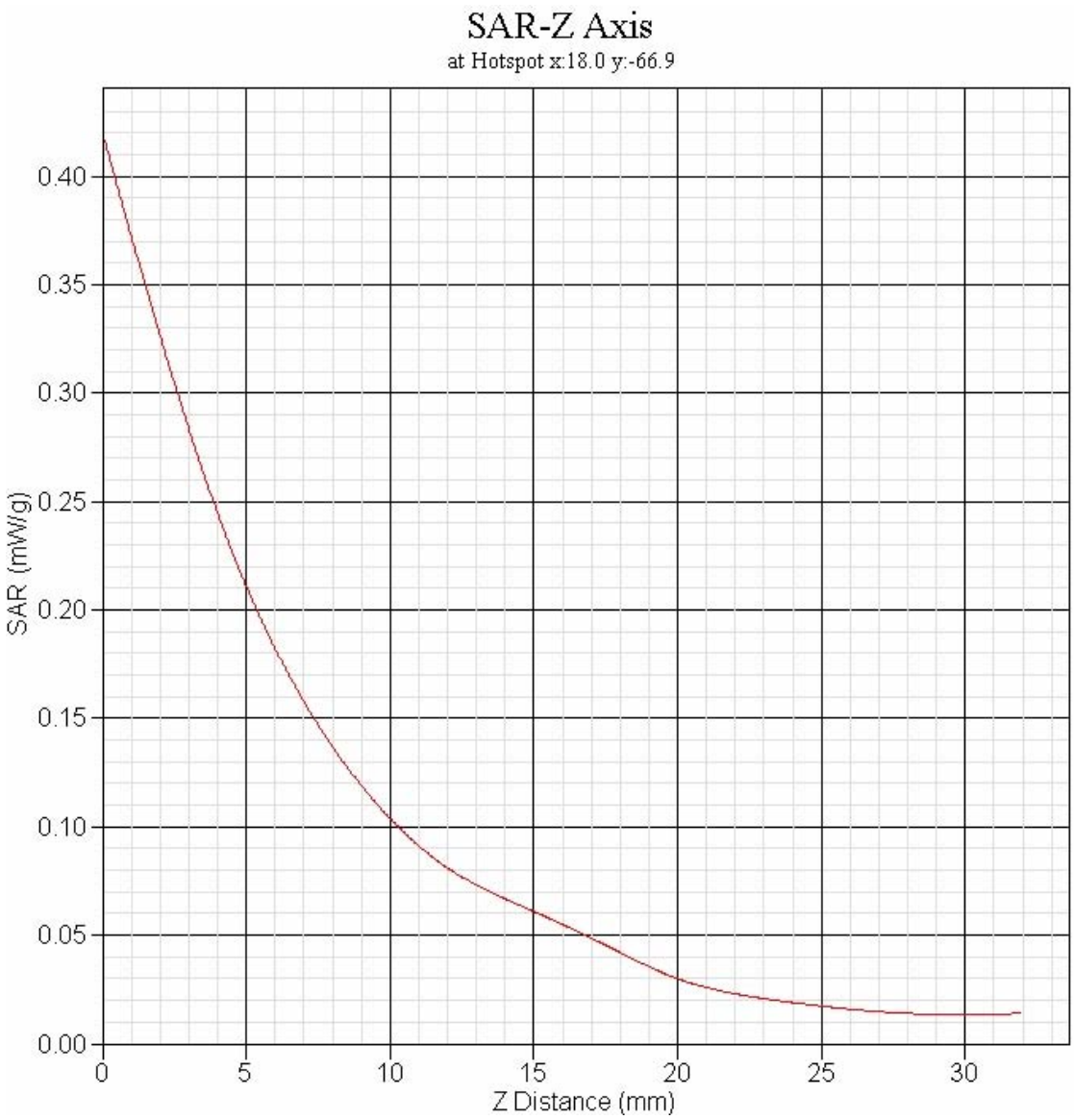



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# Appendix B
# Probe Calibration Certificate


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info@aprel.com
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**NCL CALIBRATION LABORATORIES**

Calibration File No.: CP-469

Client.: APREL

**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 5800 MHz

Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 212

Body Calibration

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2
Project No: Internal

Calibrated: 27th December 2004
Released on: 27th December 2004

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

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


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## 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-020 212.

## 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 212 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 |

## Calibration Results Summary


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| | |
|---|---|
| **Probe Type**: | E-Field Probe E-020 |
| **Serial Number:** | 212 |
| **Frequency:** | 2450 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 $\mu V/(V/m)^2$ |
| **Channel Y:** | 1.2 $\mu V/(V/m)^2$ |
| **Channel Z:** | 1.2 $\mu V/(V/m)^2$ |
| **Diode Compression Point:** | 95 mV |

**Sensitivity in Body Tissue**


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**Frequency:** 2450 MHz

**Epsilon:** 50.6 (+/-5%) **Sigma:** 2.01 S/m (+/-10%)

**ConvF**

**Channel X:** 5.0

**Channel Y:** 5.0

**Channel Z:** 5.0

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 2.4mm.

**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.

**Receiving Pattern 2450 MHz (Air)**


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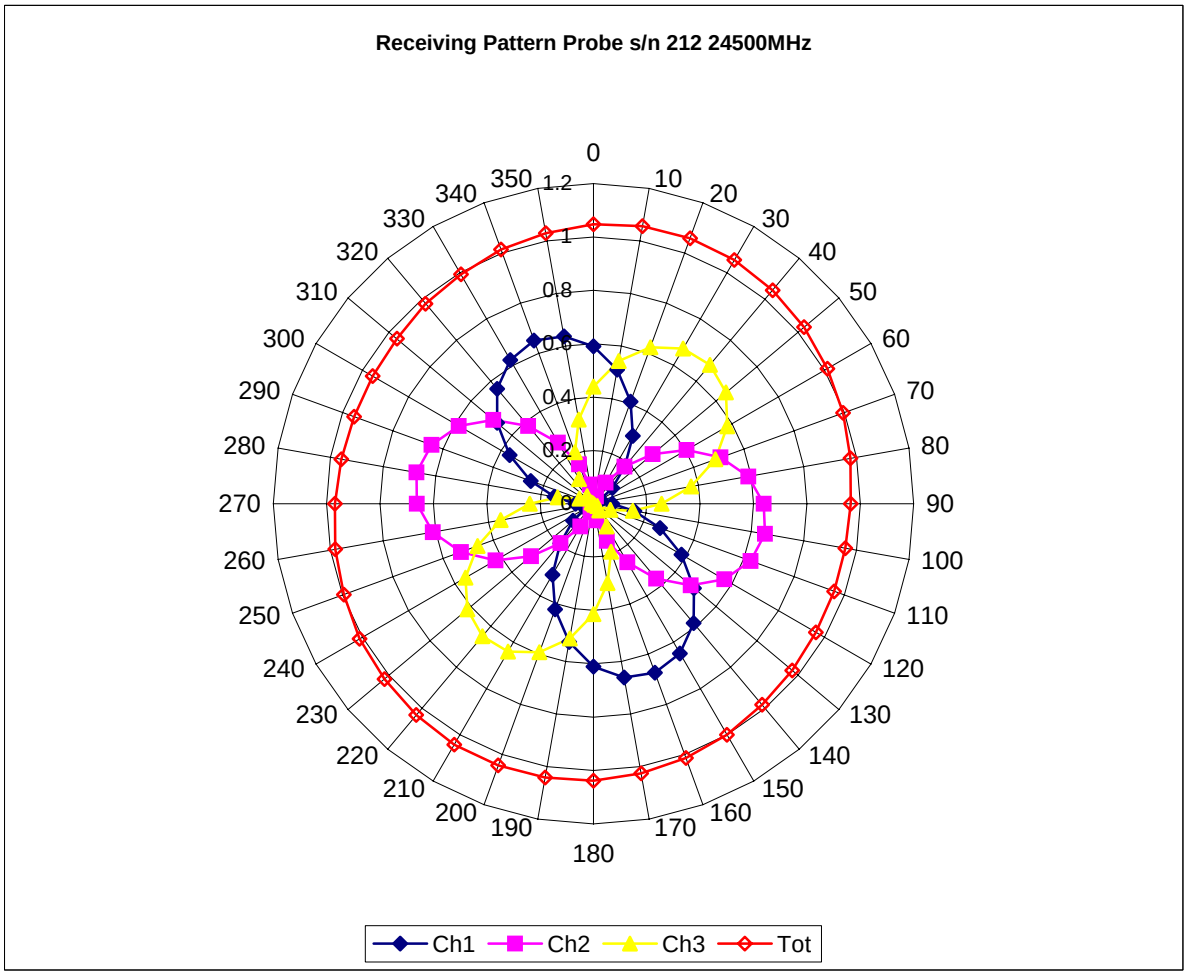



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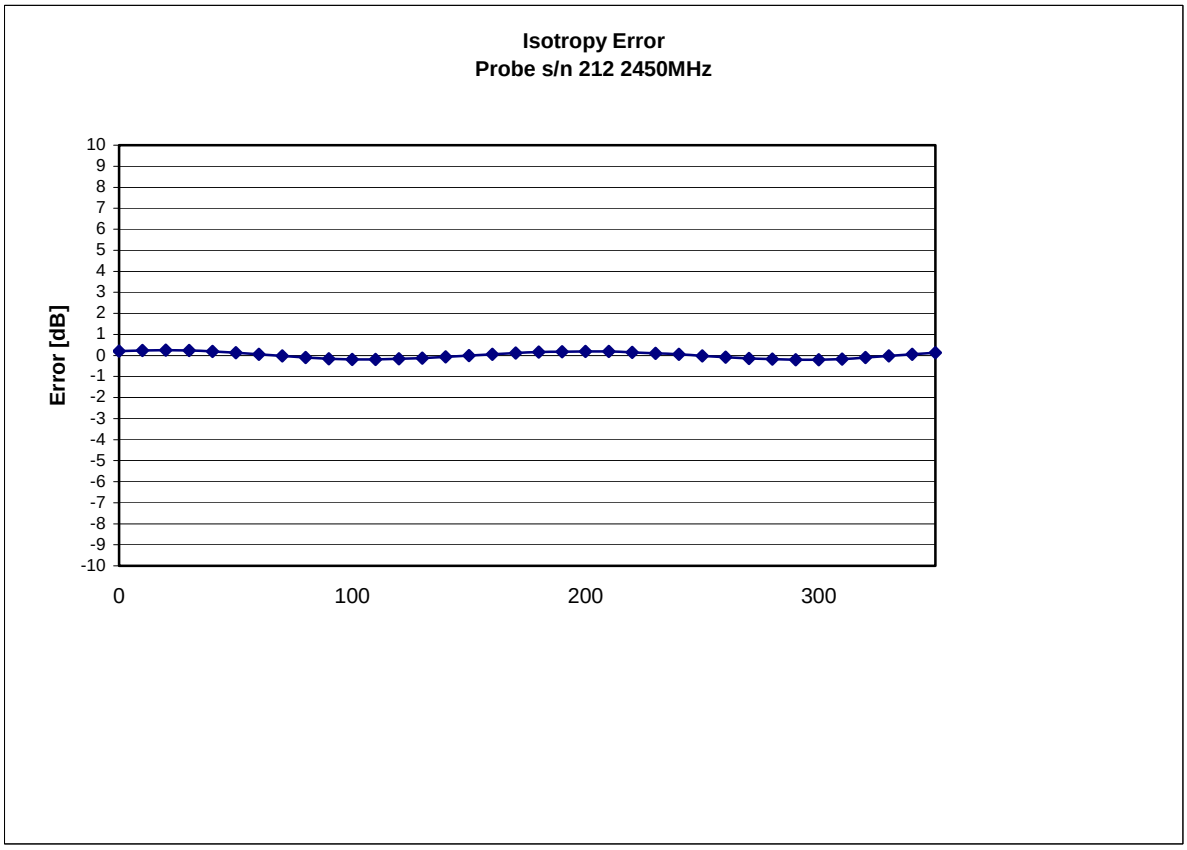
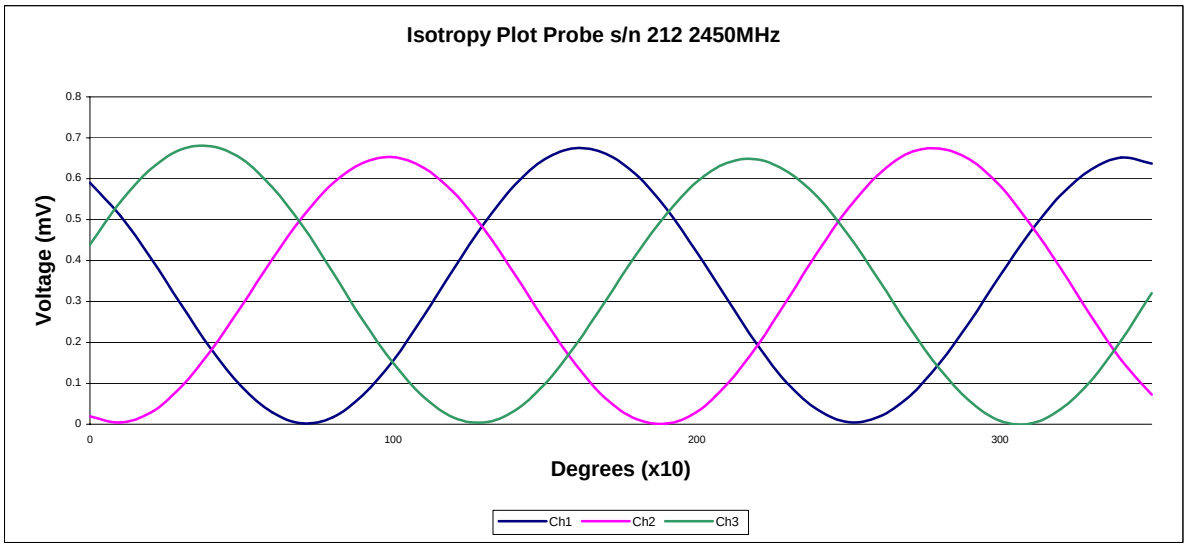
## Isotropy Error 2450 MHz (Air)




**Isotropicity:** 0.10 dB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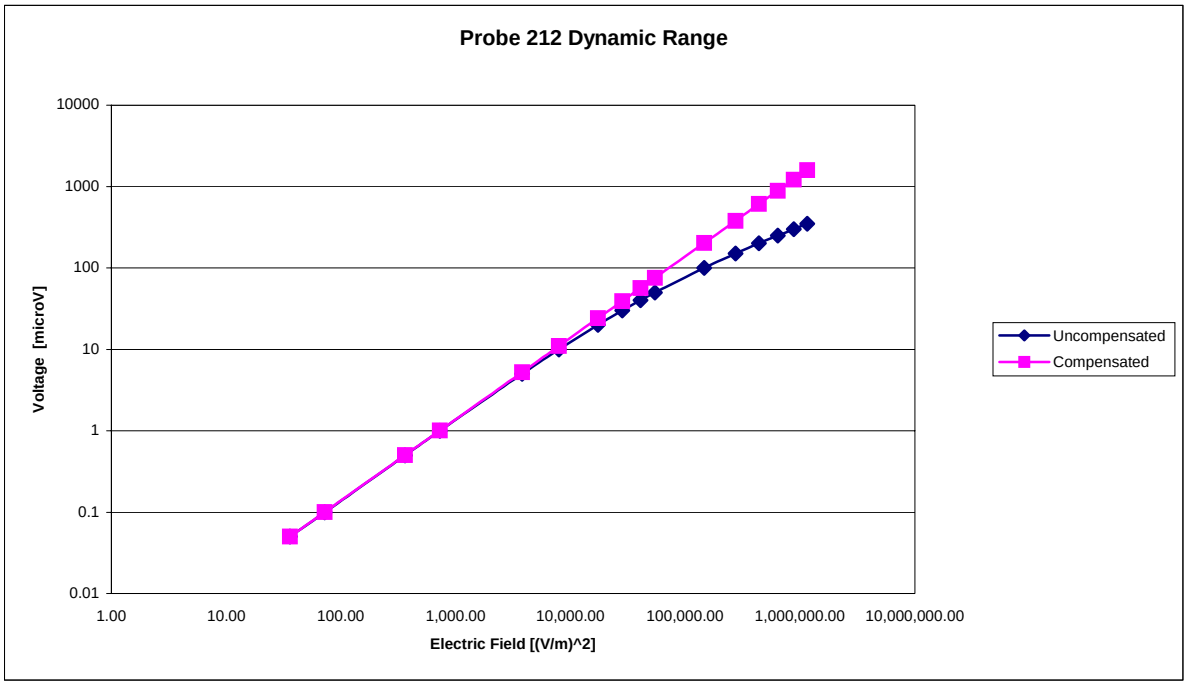
## Dynamic Range





51 Spectrum Way
Ottawa ON Canada K2R 1E6
www.aprel.com
info@aprel.com
Phone (613) 820-2730
Fax (613) 820-4161
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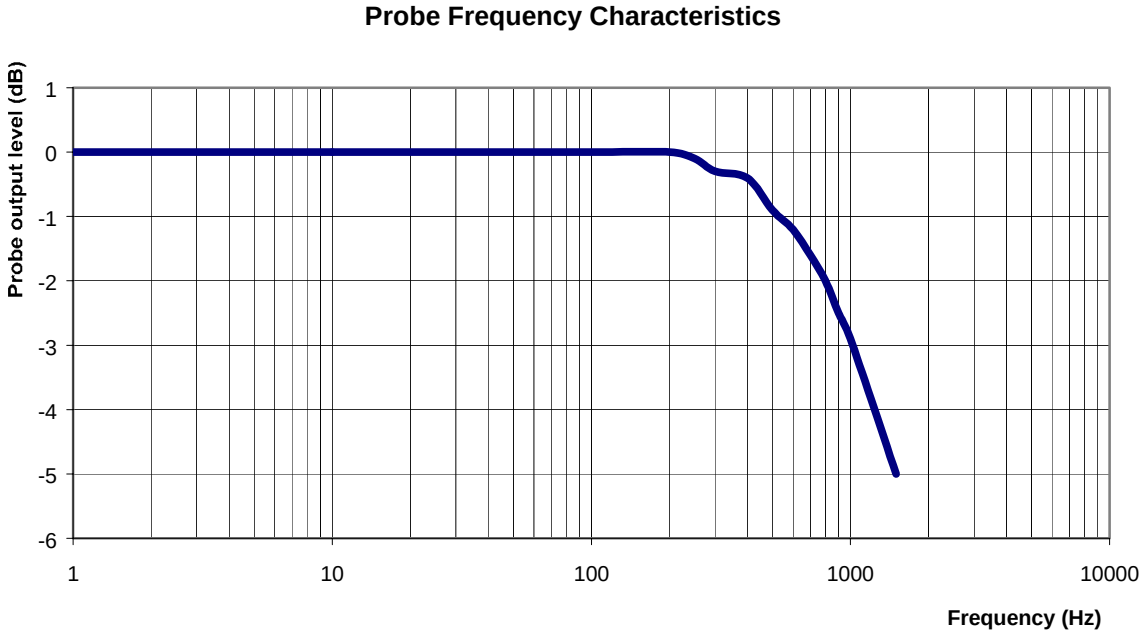
## Video Bandwidth




**Video Bandwidth at 500 Hz** 1 dB
**Video Bandwidth at 1.02 KHz:** 3 dB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**Conversion Factor Uncertainty Assessment**

**Frequency:** 2450MHz

**Epsilon:** 50.6 (+/-5%) **Sigma:** 2.01 S/m (+/-10%)

**ConvF**

**Channel X:** 5.0 7%(K=2)

**Channel Y:** 5.0 7%(K=2)

**Channel Z:** 5.0 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 2.4mm 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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# Appendix C
# Dipole Calibration Certificate


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**NCL CALIBRATION LABORATORIES**

Calibration File No: DC-0265
Project Number: Internal

**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.

APREL Validation Dipole

Manufacturer: APREL Laboratories
Part number: D-2450-S-1
Frequency: 2.45 GHz
Serial No: ALCD-10

Customer: APREL

Calibrated: 14 November 2003
Released on: 15 November 2003

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


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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.

### Mechanical Dimensions

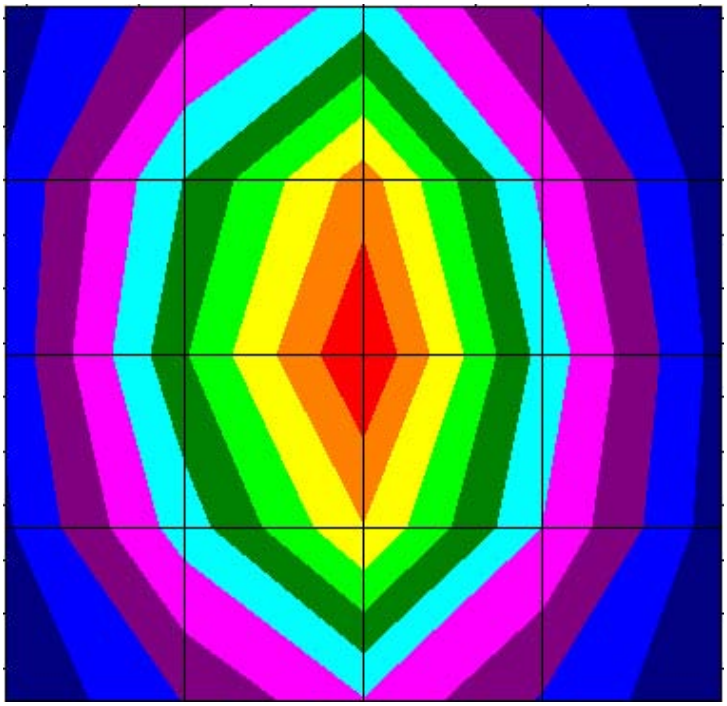
**Length:** 51.7 mm
**Height:** 30.8 mm

### Electrical Specification

**SWR:** 1.181U
**Return Loss:** -21.4 dB
**Impedance:** 46.175

### System Validation Results

| Frequency | 1 Gram | 10 Gram | Peak |
|---|---|---|---|
| 2.45 GHz | 52.45 | 22.91 | 102.91 |

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## 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 ALCD-10 at 2.45 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 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 ALCD-10 was a new Dipole taken from stock prior to calibration.

**Ambient Temperature of the Laboratory:** 24 °C +/- 0.5°C
**Temperature of the Tissue:** 20 °C +/- 0.5°C


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## Dipole Calibration Results

### Mechanical Verification

| IEEE Length | IEEE Height | Measured Length | Measured Height |
|---|---|---|---|
| 51.5 mm | 30.4 mm | 51.7 mm | 30.8 mm |

### Tissue Validation

| Head Tissue 2450 MHz | Measured |
|---|---|
| Dielectric constant, $\varepsilon_r$ | 39.2 |
| Conductivity, $\sigma$ [S/m] | 1.82 |
| Tissue Conversion Factor, | 4.61 |


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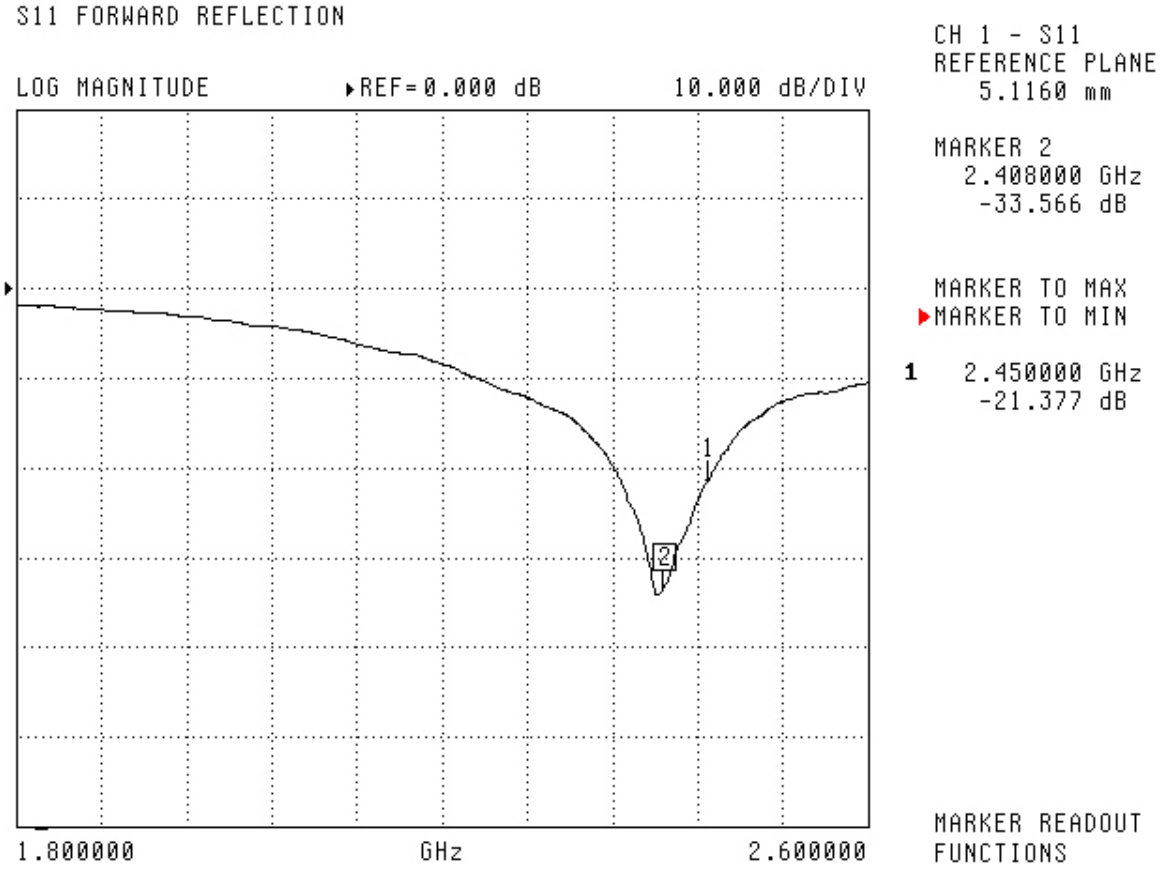
## Electrical Calibration

| Test | Result | IEEE Value |
|---|---|---|
| S11 R/L | -21.4 | -21 dB |
| SWR | 1.181U | - |
| Impedance | 46.175 Ω | |

The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss





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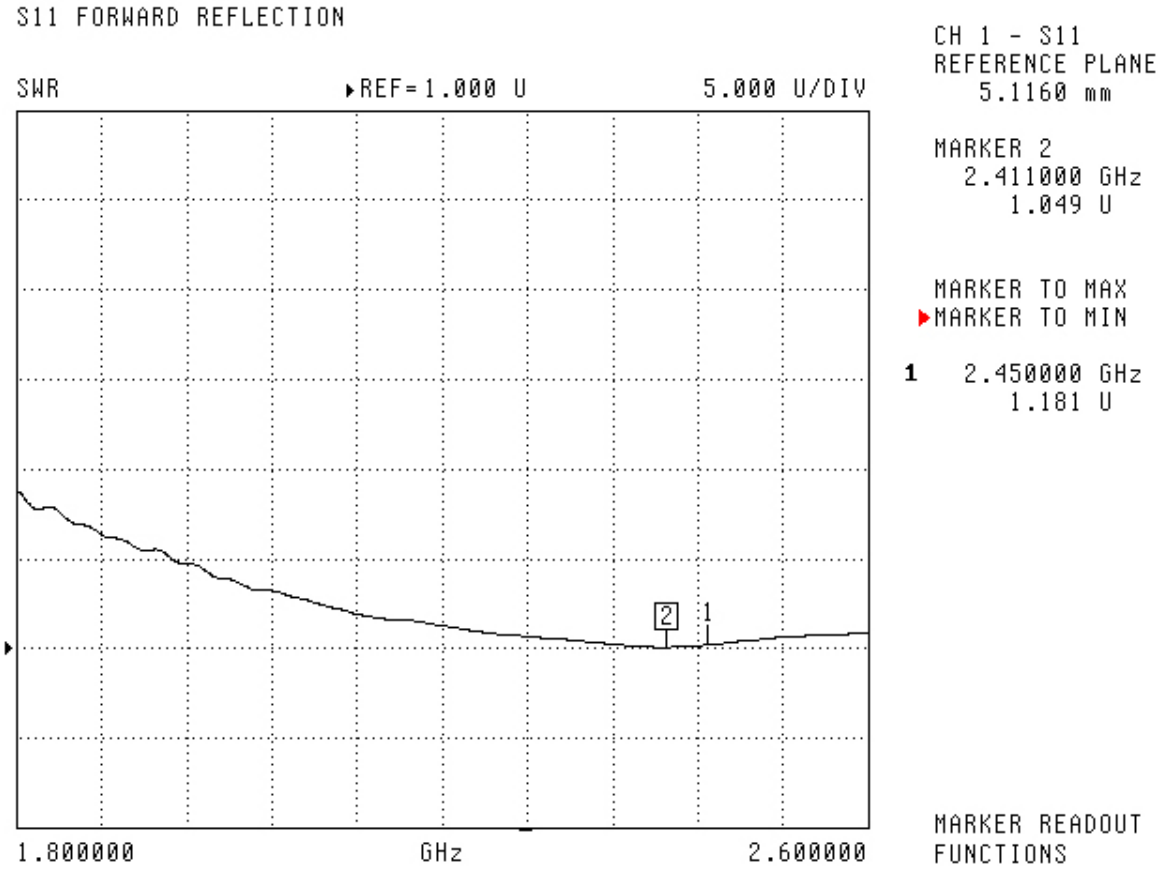
## SWR





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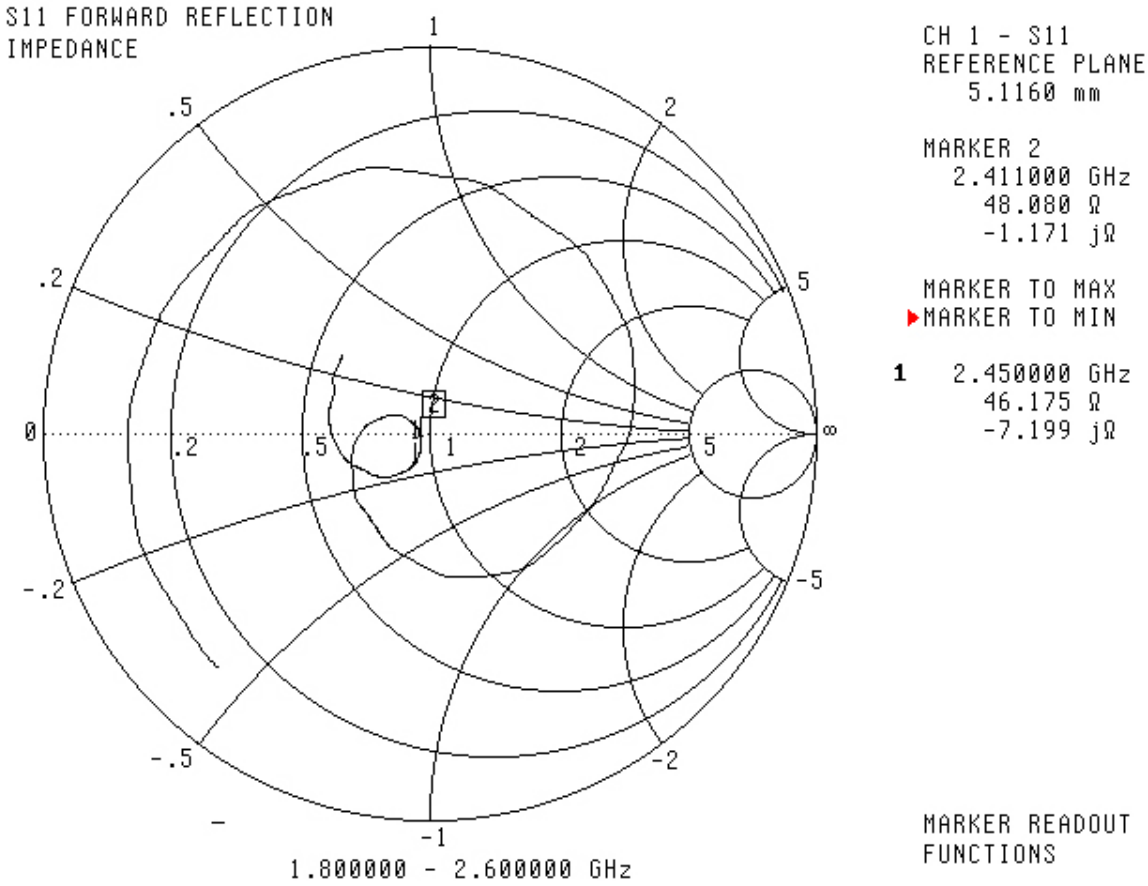
## Smith Chart Dipole Impedance





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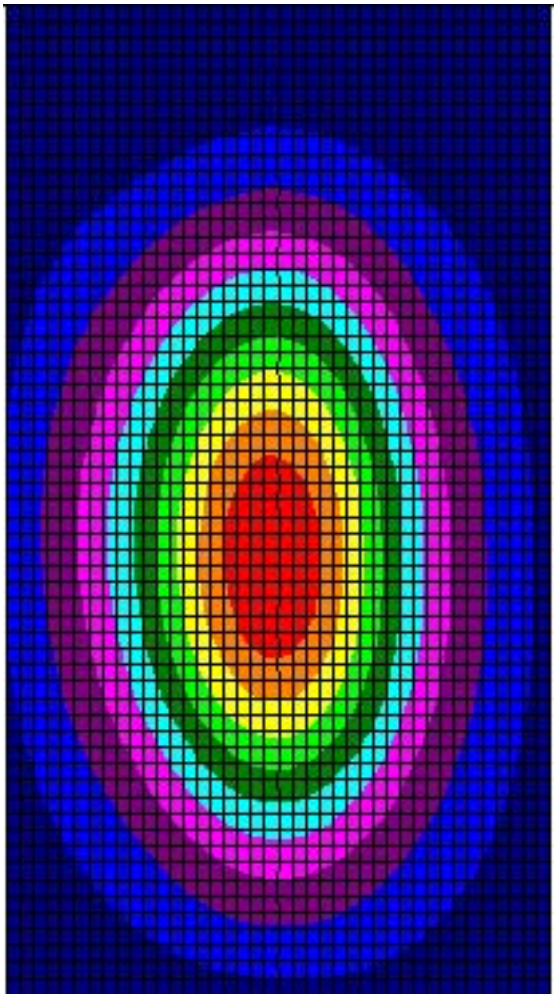
## System Validation Results Using the Electrically Calibrated Dipole

| Frequency | 1 Gram | 10 Gram | Peak Above Feed Point |
|---|---|---|---|
| 2.45 GHz | 52.45 | 22.91 | 102.91 |

The following Graphic Plot is the splined measurement result for the course scan.




51 Spectrum Way
Ottawa ON Canada K2R 1E6
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www.aprel.com
info@aprel.com
Phone (613) 820-2730
Fax (613) 820-4161
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