

## SAR Test Report

Operator : 123  
 Validation Date : 29-Jul-2004  
 Measurement Date : 29-Jul-2004  
 Starting Time : 29-Jul-2004 12:53:49 PM  
 End Time : 29-Jul-2004 01:04:56 PM  
 Scanning Time : 667 secs

Product Data  
 Device Name : Molokai  
 Serial No. : 8143-EZ100244-M0206J-M000  
 Type : Other  
 Model : 802.11 BG  
 Frequency : 2450.00 MHz  
 Max. Transmit Pwr : 0.055 W  
 Drift Time : 0 min(s)  
 Length : 127  
 Width : 94  
 Depth : 0  
 Antenna Type : Internal  
 Power Drift-Start : 0.00  
 Power Drift-Finish : 0.00  
 Power Drift : 0.00

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

Tissue Data  
 Type : Body  
 Serial No. : 2450  
 Frequency : 2450 MHz  
 Calibration Date : 28-Jul-2004  
 Temperature : 23 °C  
 Ambient Temp. : 23 °C  
 Humidity : 75 RH%  
 Epsilon : 47.9 F/m  
 Sigma : 1.9 S/m  
 Density : 1000 kg/cu. m

Probe Data  
 Name : APREL Probe 212  
 Model : E020  
 Type : E-Field Triangle  
 Serial No. : 212  
 Calibration Date : 04-Jun-2004  
 Frequency : 2450 MHz  
 Duty Cycle Factor : 1  
 Conversion Factor : 3.3  
 Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{sq. m})$   
 Compression Point : 95  
 Offset : 1.56

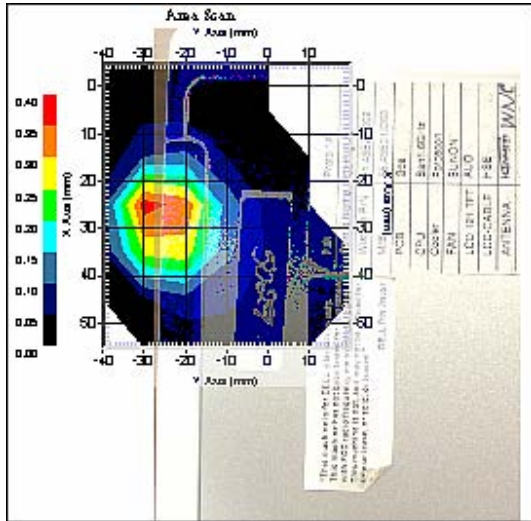


Measurement Data

Crest Factor : 1  
 Scan Type : Complete  
 Set-up Date : 29-Jul-2004  
 Set-up Time : 11:38:38 AM

Other Data

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



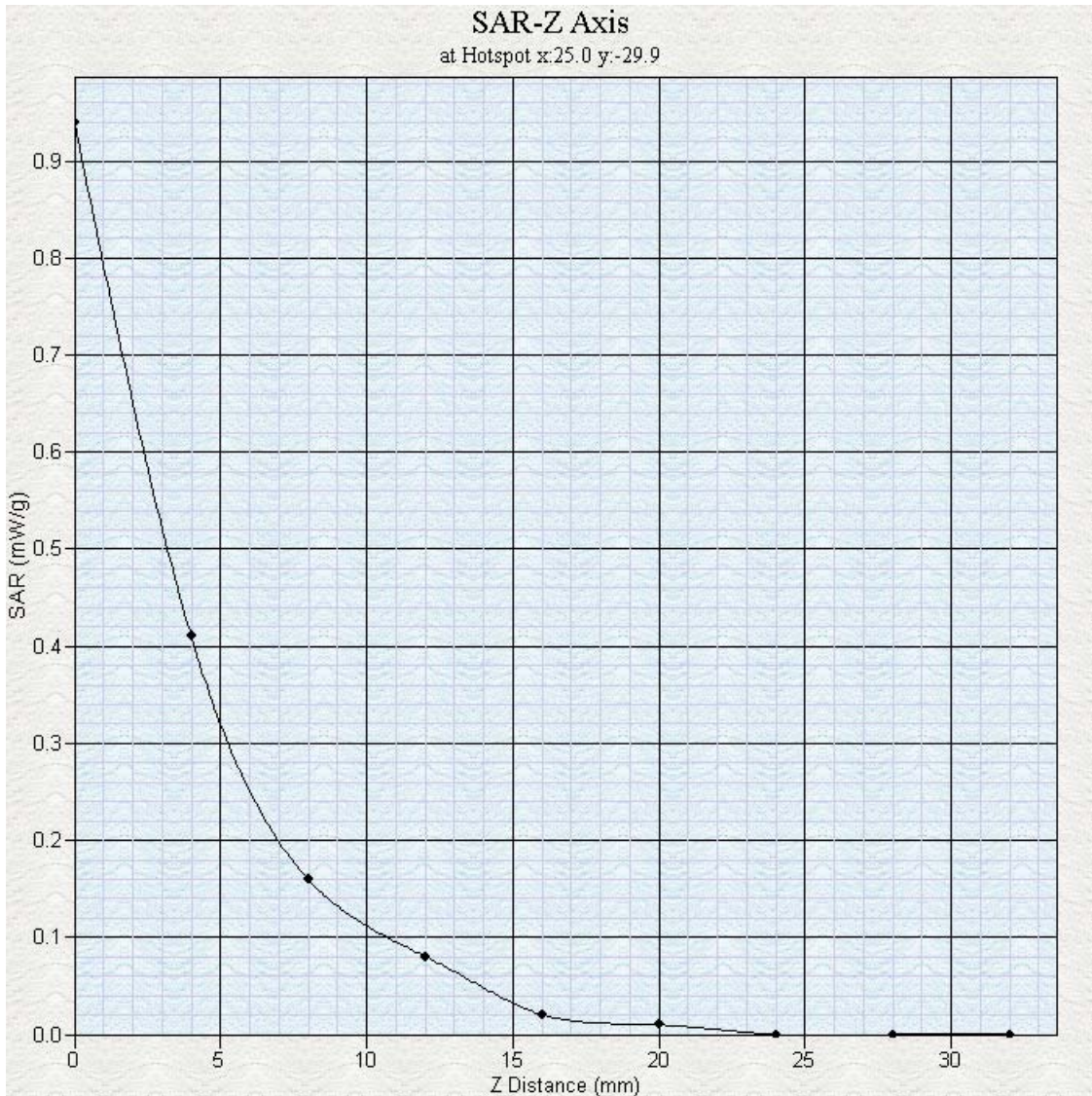
1 gram SAR value : 0.33 W/kg



### Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (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	$\sqrt{3}$	$(\frac{1-cp}{2})^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	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	0.0	rectangular	$\sqrt{3}$	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	4.8	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal (k=2)				20.6	19.1

### Z-Axis Plot



## SAR Test Report

Operator : 123  
 Validation Date : 29-Jul-2004  
 Measurement Date : 29-Jul-2004  
 Starting Time : 29-Jul-2004 01:12:48 PM  
 End Time : 29-Jul-2004 01:23:54 PM  
 Scanning Time : 666 secs

Product Data  
 Device Name : Molokai  
 Serial No. : 8143-EZ100244-M0206J-M000  
 Type : Other  
 Model : 802.11 BG  
 Frequency : 2450.00 MHz  
 Max. Transmit Pwr : 0.055 W  
 Drift Time : 0 min(s)  
 Length : 127  
 Width : 94  
 Depth : 0  
 Antenna Type : Internal  
 Power Drift-Start : 0.00  
 Power Drift-Finish : 0.00  
 Power Drift : 0.00

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

Tissue Data  
 Type : Body  
 Serial No. : 2450  
 Frequency : 2450 MHz  
 Calibration Date : 28-Jul-2004  
 Temperature : 23 °C  
 Ambient Temp. : 23 °C  
 Humidity : 75 RH%  
 Epsilon : 47.9 F/m  
 Sigma : 1.9 S/m  
 Density : 1000 kg/cu. m

Probe Data  
 Name : APREL Probe 212  
 Model : E020  
 Type : E-Field Triangle  
 Serial No. : 212  
 Calibration Date : 04-Jun-2004  
 Frequency : 2450 MHz  
 Duty Cycle Factor: 1  
 Conversion Factor: 3.3  
 Probe Sensitivity: 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{sq. m})$   
 Compression Point: 95  
 Offset : 1.56

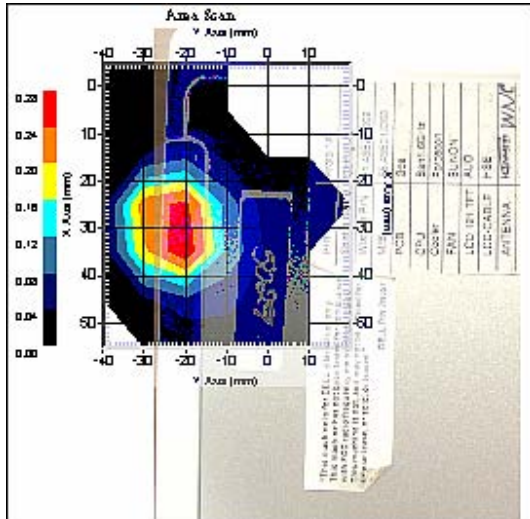


Measurement Data

Crest Factor : 1  
 Scan Type : Complete  
 Set-up Date : 29-Jul-2004  
 Set-up Time : 11:38:38 AM

Other Data

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



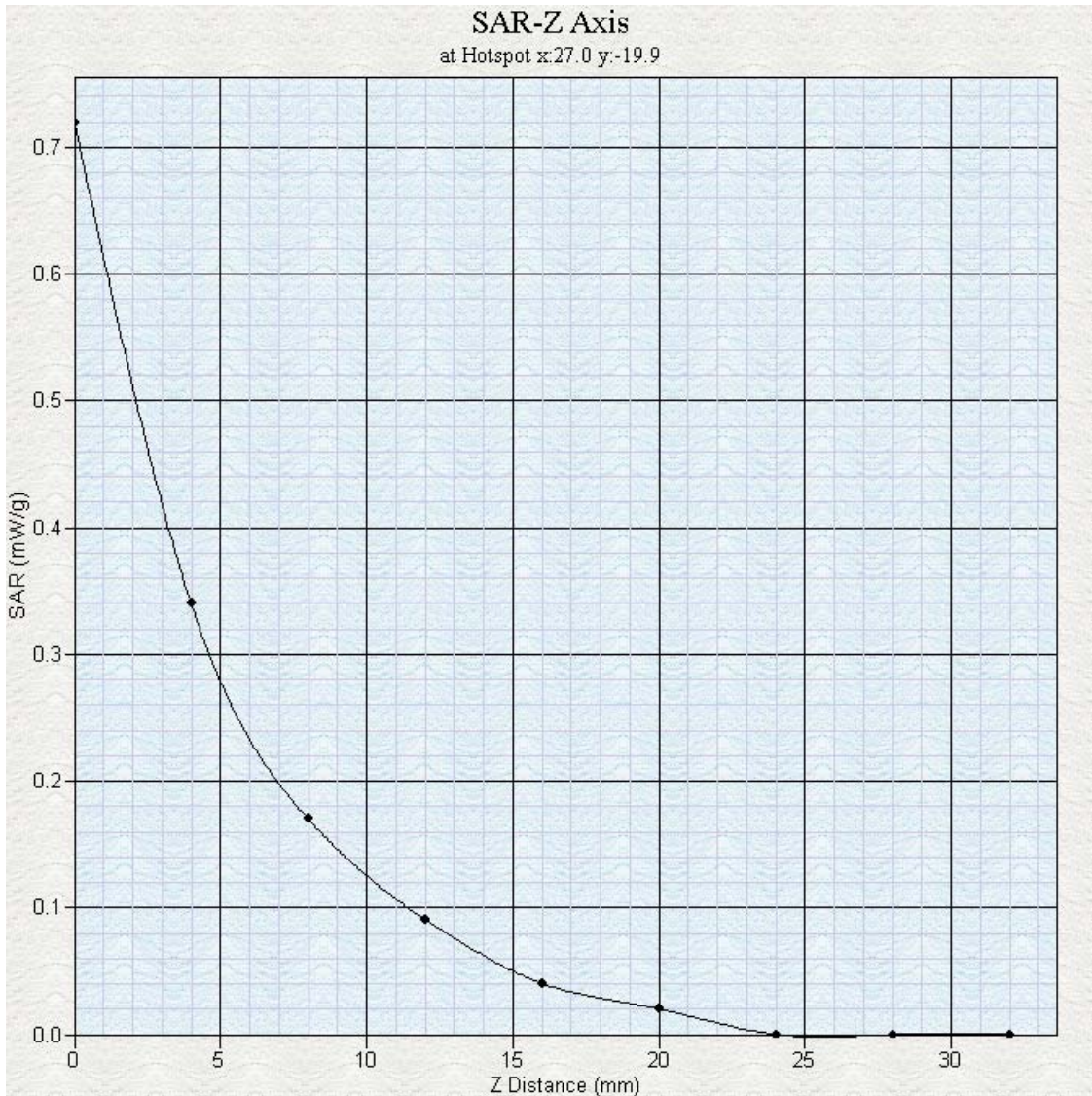
1 gram SAR value : 0.26 W/kg



### Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (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	$\sqrt{3}$	$(\frac{1-cp}{2})^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	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	0.0	rectangular	$\sqrt{3}$	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	4.8	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal (k=2)				20.6	19.1

## Z-Axis Plot





## SAR Test Report

Operator : 123  
Validation Date : 29-Jul-2004  
Measurement Date : 29-Jul-2004  
Starting Time : 29-Jul-2004 01:32:26 PM  
End Time : 29-Jul-2004 01:43:32 PM  
Scanning Time : 666 secs

Product Data  
Device Name : Molokai  
Serial No. : 8143-EZ100244-M0206J-M000  
Type : Other  
Model : 802.11 BG  
Frequency : 2450.00 MHz  
Max. Transmit Pwr : 0.055 W  
Drift Time : 0 min(s)  
Length : 127  
Width : 94  
Depth : 0  
Antenna Type : Internal  
Power Drift-Start : 0.00  
Power Drift-Finish : 0.00  
Power Drift : 0.00

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

Tissue Data  
Type : Body  
Serial No. : 2450  
Frequency : 2450 MHz  
Calibration Date : 28-Jul-2004  
Temperature : 23 °C  
Ambient Temp. : 23 °C  
Humidity : 75 RH%  
Epsilon : 47.9 F/m  
Sigma : 1.9 S/m  
Density : 1000 kg/cu. m

Probe Data  
Name : APREL Probe 212  
Model : E020  
Type : E-Field Triangle  
Serial No. : 212  
Calibration Date : 04-Jun-2004  
Frequency : 2450 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 3.3  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{sq. m})$   
Compression Point : 95  
Offset : 1.56

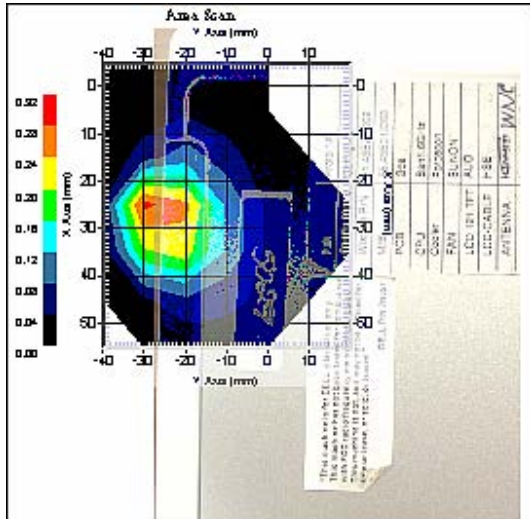


Measurement Data

Crest Factor : 1  
 Scan Type : Complete  
 Set-up Date : 29-Jul-2004  
 Set-up Time : 11:38:38 AM

Other Data

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



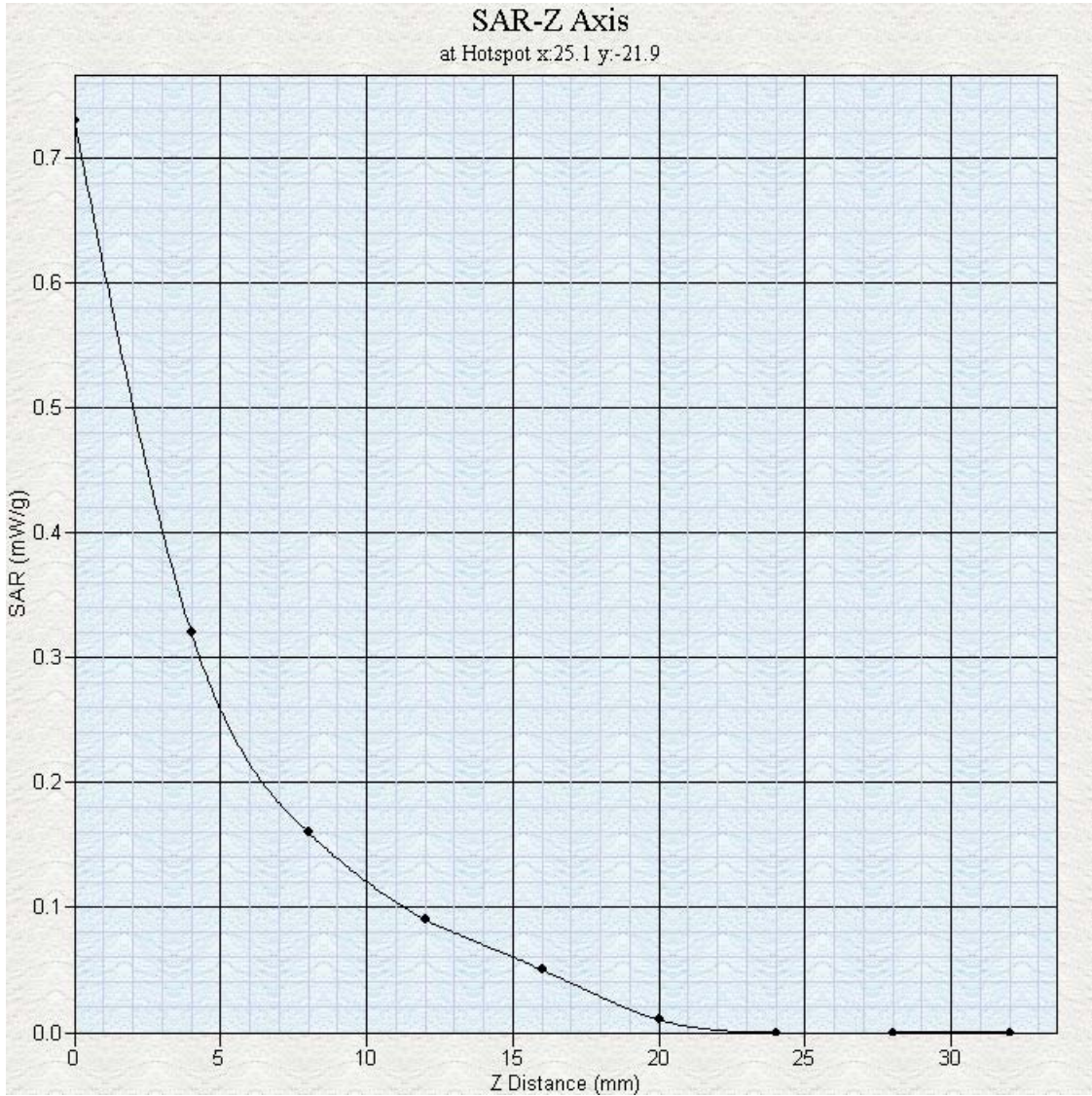
1 gram SAR value : 0.27 W/kg



### Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (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	$\sqrt{3}$	$(\frac{1-cp}{2})^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	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	0.0	rectangular	$\sqrt{3}$	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	4.8	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal (k=2)				20.6	19.1

## Z-Axis Plot



## SAR Test Report

Operator : 123  
 Validation Date : 29-Jul-2004  
 Measurement Date : 29-Jul-2004  
 Starting Time : 29-Jul-2004 04:07:58 PM  
 End Time : 29-Jul-2004 04:20:44 PM  
 Scanning Time : 766 secs

Product Data  
 Device Name : Molokai  
 Serial No. : 8143-EZ100244-M0206J-M000  
 Type : Other  
 Model : 802.11 BG  
 Frequency : 2450.00 MHz  
 Max. Transmit Pwr : 0.055 W  
 Drift Time : 0 min(s)  
 Length : 130  
 Width : 36  
 Depth : 0  
 Antenna Type : Internal  
 Power Drift-Start : 0.24  
 Power Drift-Finish: 0.37  
 Power Drift : 0.13

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

Tissue Data  
 Type : Body  
 Serial No. : 2450  
 Frequency : 2450 MHz  
 Calibration Date : 28-Jul-2004  
 Temperature : 23 °C  
 Ambient Temp. : 23 °C  
 Humidity : 75 RH%  
 Epsilon : 47.9 F/m  
 Sigma : 1.9 S/m  
 Density : 1000 kg/cu. m

Probe Data  
 Name : APREL Probe 212  
 Model : E020  
 Type : E-Field Triangle  
 Serial No. : 212  
 Calibration Date : 04-Jun-2004  
 Frequency : 2450 MHz  
 Duty Cycle Factor: 1  
 Conversion Factor: 3.3  
 Probe Sensitivity: 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{sq. m})$   
 Compression Point: 95  
 Offset : 1.56

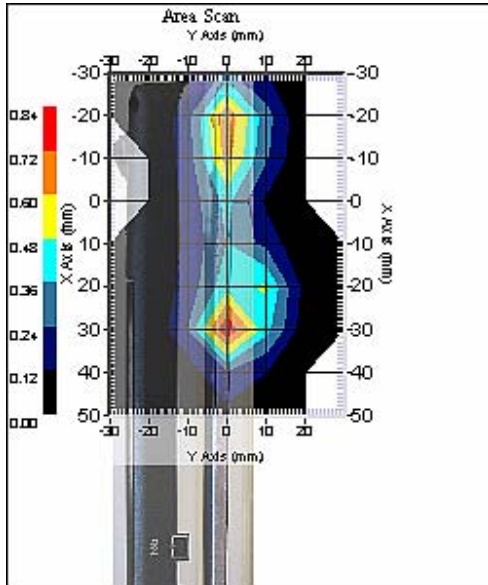


Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Set-up Date : 29-Jul-2004  
Set-up Time : 11:38:38 AM

Other Data

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

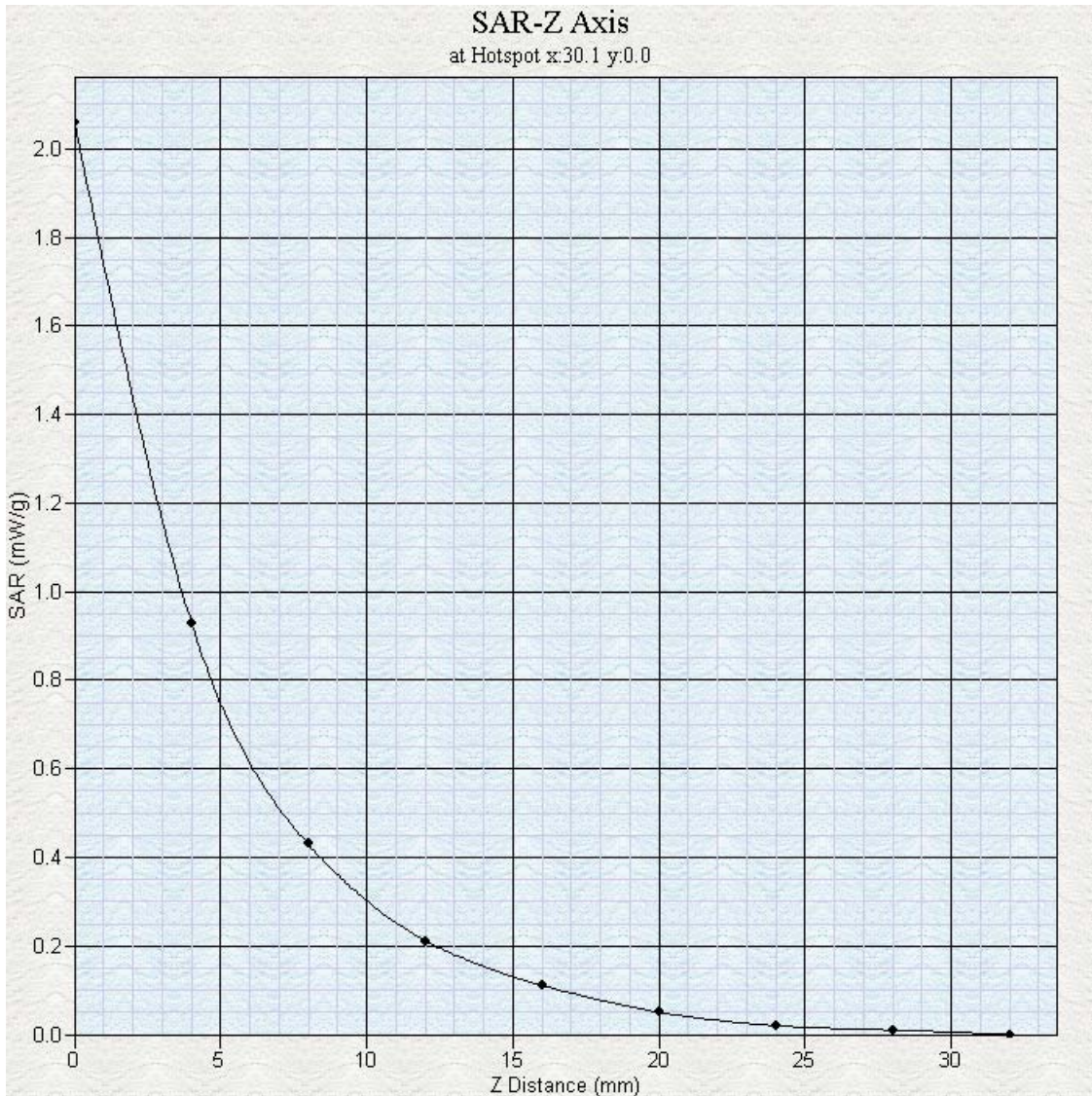


1 gram SAR value : 0.71 W/kg

### Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (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	$\sqrt{3}$	$(\frac{1-cp}{2})^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	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	0.1	rectangular	$\sqrt{3}$	1	1	0.1	0.1
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	4.8	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal (k=2)				20.6	19.1

## Z-Axis Plot





## SAR Test Report

Operator : 123  
 Validation Date : 29-Jul-2004  
 Measurement Date : 29-Jul-2004  
 Starting Time : 29-Jul-2004 04:31:01 PM  
 End Time : 29-Jul-2004 04:43:44 PM  
 Scanning Time : 763 secs

### Product Data

Device Name : Molokai  
 Serial No. : 8143-EZ100244-M0206J-M000  
 Type : Other  
 Model : 802.11 BG  
 Frequency : 2450.00 MHz  
 Max. Transmit Pwr : 0.055 W  
 Drift Time : 0 min(s)  
 Length : 130  
 Width : 36  
 Depth : 0  
 Antenna Type : Internal  
 Power Drift-Start : 0.08  
 Power Drift-Finish : 0.06  
 Power Drift : 0.02

### Phantom Data

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

### Tissue Data

Type : Body  
 Serial No. : 2450  
 Frequency : 2450 MHz  
 Calibration Date : 28-Jul-2004  
 Temperature : 23 °C  
 Ambient Temp. : 23 °C  
 Humidity : 75 RH%  
 Epsilon : 47.9 F/m  
 Sigma : 1.9 S/m  
 Density : 1000 kg/cu. m

### Probe Data

Name : APREL Probe 212  
 Model : E020  
 Type : E-Field Triangle  
 Serial No. : 212  
 Calibration Date : 04-Jun-2004  
 Frequency : 2450 MHz  
 Duty Cycle Factor: 1  
 Conversion Factor: 3.3  
 Probe Sensitivity: 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{sq. m})$   
 Compression Point: 95  
 Offset : 1.56

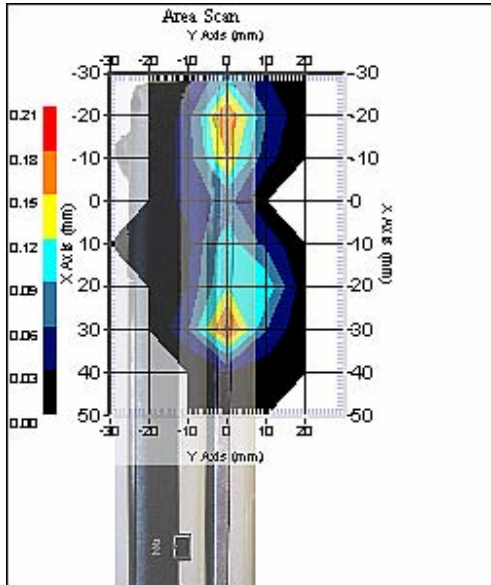


Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Set-up Date : 29-Jul-2004  
Set-up Time : 11:38:38 AM

Other Data

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

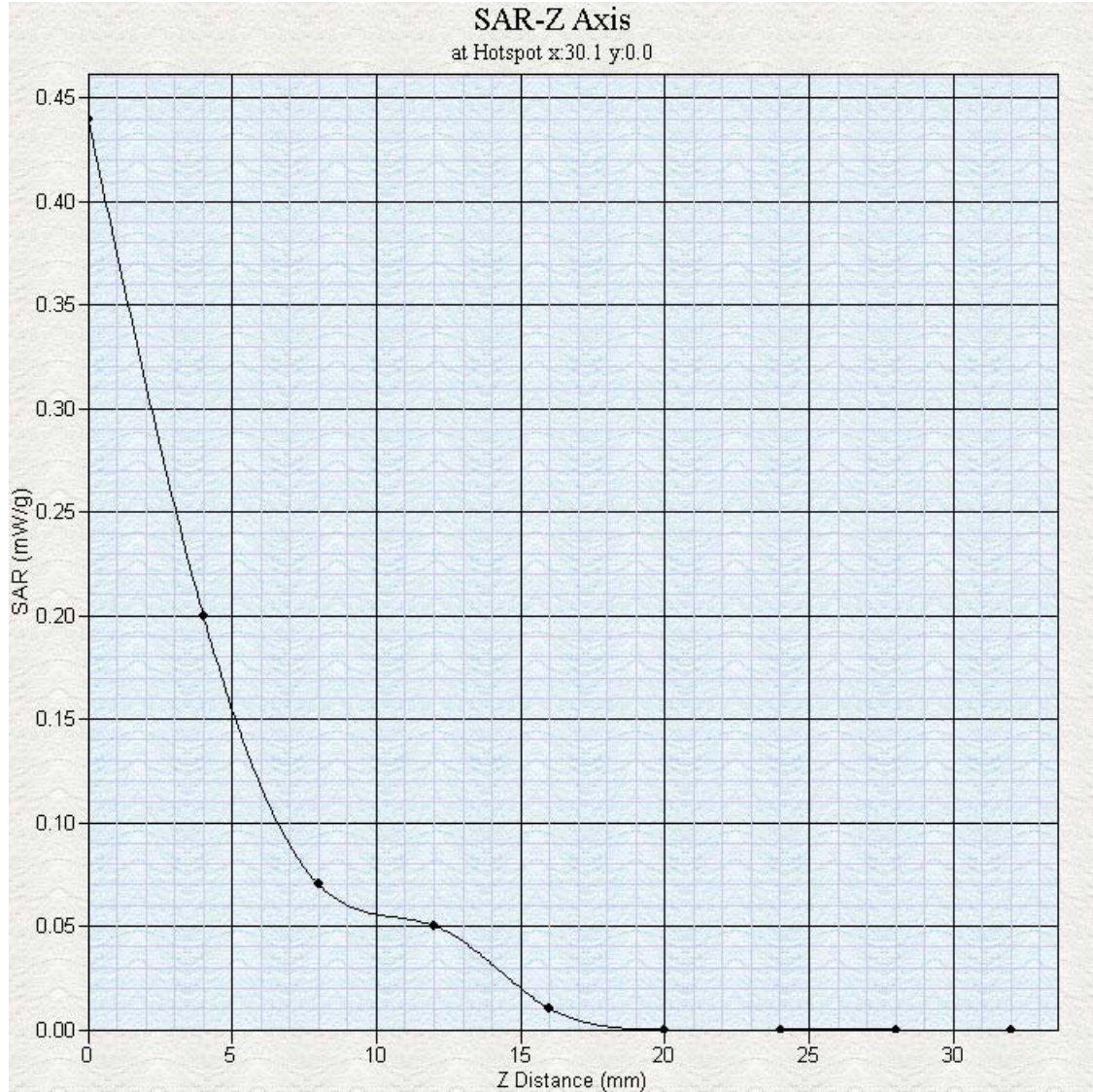


1 gram SAR value : 0.15 W/kg

### Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (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	$\sqrt{3}$	$(\frac{1-cp}{2})^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	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	0.0	rectangular	$\sqrt{3}$	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	4.8	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal (k=2)				20.6	19.1

## Z-Axis Plot



## SAR Test Report

Operator : 123  
 Validation Date : 29-Jul-2004  
 Measurement Date : 29-Jul-2004  
 Starting Time : 29-Jul-2004 03:09:47 PM  
 End Time : 29-Jul-2004 03:22:33 PM  
 Scanning Time : 766 secs

Product Data  
 Device Name : Molokai  
 Serial No. : 8143-EZ100244-M0206J-M000  
 Type : Other  
 Model : 802.11 BG  
 Frequency : 2450.00 MHz  
 Max. Transmit Pwr : 0.055 W  
 Drift Time : 0 min(s)  
 Length : 110  
 Width : 32  
 Depth : 0  
 Antenna Type : Internal  
 Power Drift-Start : 0.29  
 Power Drift-Finish: 0.41  
 Power Drift : 0.12

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

Tissue Data  
 Type : Body  
 Serial No. : 2450  
 Frequency : 2450 MHz  
 Calibration Date : 28-Jul-2004  
 Temperature : 23 °C  
 Ambient Temp. : 23 °C  
 Humidity : 75 RH%  
 Epsilon : 47.9 F/m  
 Sigma : 1.9 S/m  
 Density : 1000 kg/cu. m

Probe Data  
 Name : APREL Probe 212  
 Model : E020  
 Type : E-Field Triangle  
 Serial No. : 212  
 Calibration Date : 04-Jun-2004  
 Frequency : 2450 MHz  
 Duty Cycle Factor: 1  
 Conversion Factor: 3.3  
 Probe Sensitivity: 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{sq. m})$   
 Compression Point: 95  
 Offset : 1.56

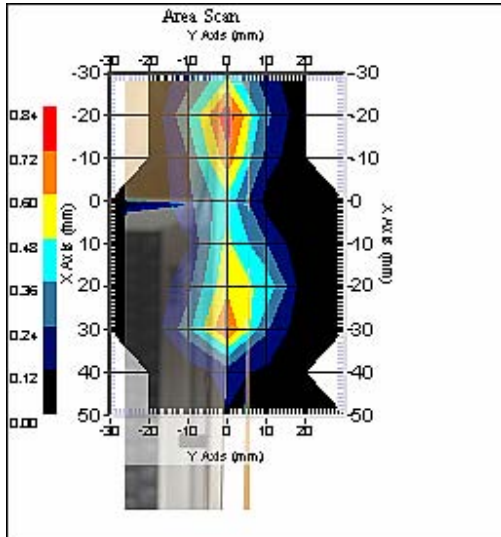


Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Set-up Date : 29-Jul-2004  
Set-up Time : 11:38:38 AM

Other Data

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

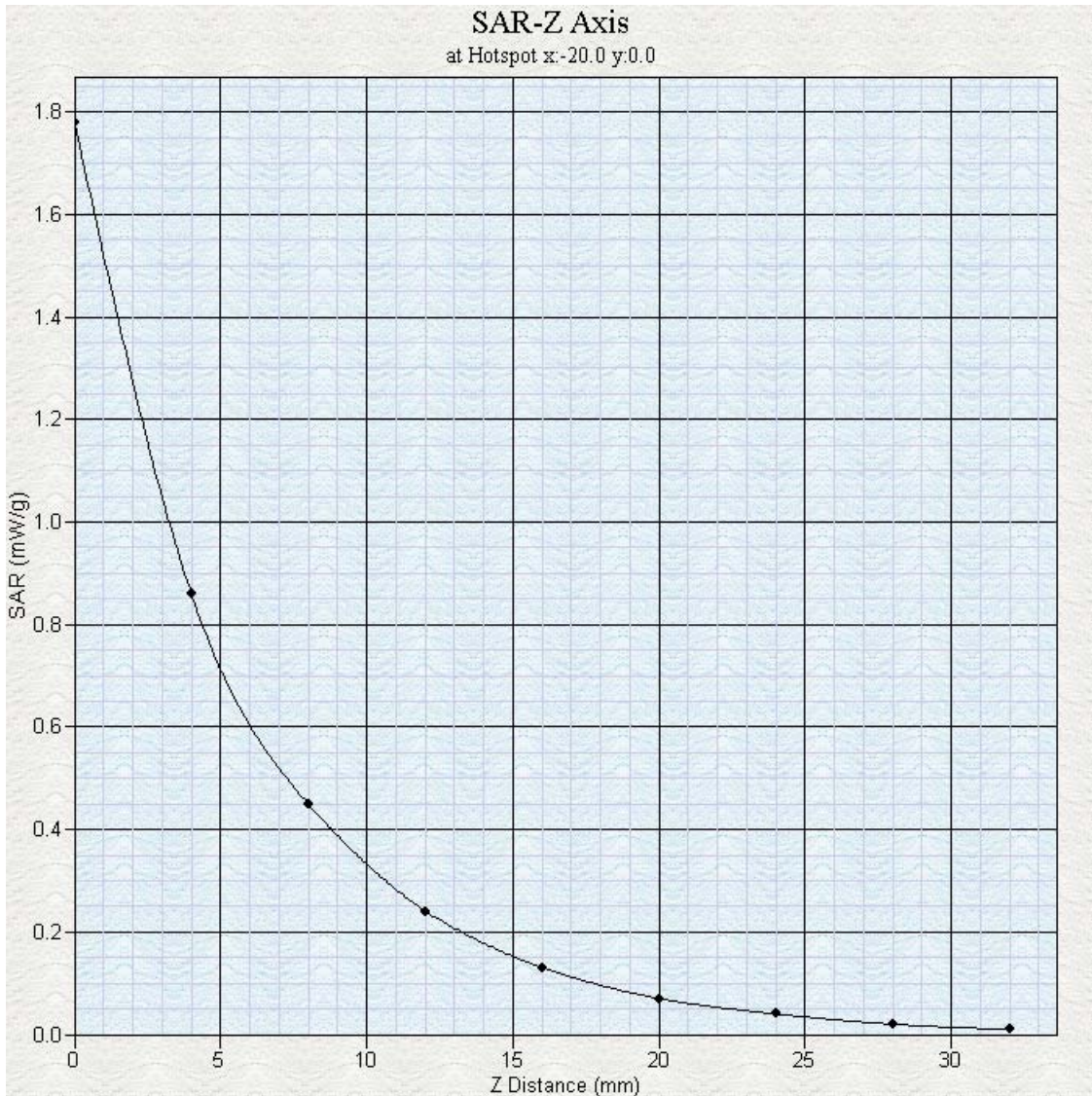


1 gram SAR value : 0.70 W/kg

### Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (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	$\sqrt{3}$	$(\frac{1-cp}{2})^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	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	0.1	rectangular	$\sqrt{3}$	1	1	0.1	0.1
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	4.8	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal (k=2)				20.6	19.1

## Z-Axis Plot





## SAR Test Report

Operator : 123  
 Validation Date : 29-Jul-2004  
 Measurement Date : 29-Jul-2004  
 Starting Time : 29-Jul-2004 03:31:36 PM  
 End Time : 29-Jul-2004 03:44:19 PM  
 Scanning Time : 763 secs

Product Data  
 Device Name : Molokai  
 Serial No. : 8143-EZ100244-M0206J-M000  
 Type : Other  
 Model : 802.11 BG  
 Frequency : 2450.00 MHz  
 Max. Transmit Pwr : 0.055 W  
 Drift Time : 0 min(s)  
 Length : 110  
 Width : 32  
 Depth : 0  
 Antenna Type : Internal  
 Power Drift-Start : 0.10  
 Power Drift-Finish : 0.08  
 Power Drift : 0.02

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

Tissue Data  
 Type : Body  
 Serial No. : 2450  
 Frequency : 2450 MHz  
 Calibration Date : 28-Jul-2004  
 Temperature : 23 °C  
 Ambient Temp. : 23 °C  
 Humidity : 75 RH%  
 Epsilon : 47.9 F/m  
 Sigma : 1.9 S/m  
 Density : 1000 kg/cu. m

Probe Data  
 Name : APREL Probe 212  
 Model : E020  
 Type : E-Field Triangle  
 Serial No. : 212  
 Calibration Date : 04-Jun-2004  
 Frequency : 2450 MHz  
 Duty Cycle Factor : 1  
 Conversion Factor : 3.3  
 Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{sq. m})$   
 Compression Point : 95  
 Offset : 1.56

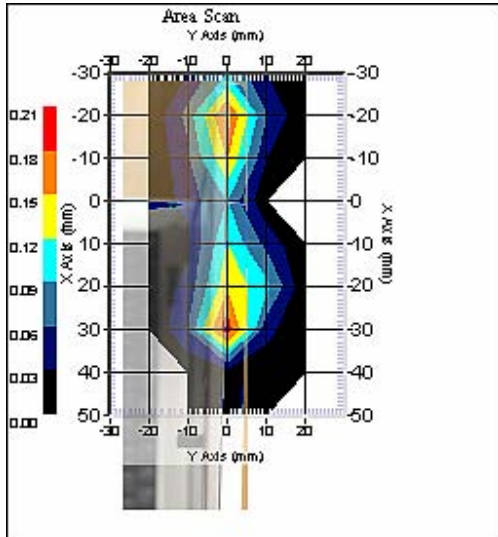


Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Set-up Date : 29-Jul-2004  
Set-up Time : 11:38:38 AM

Other Data

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

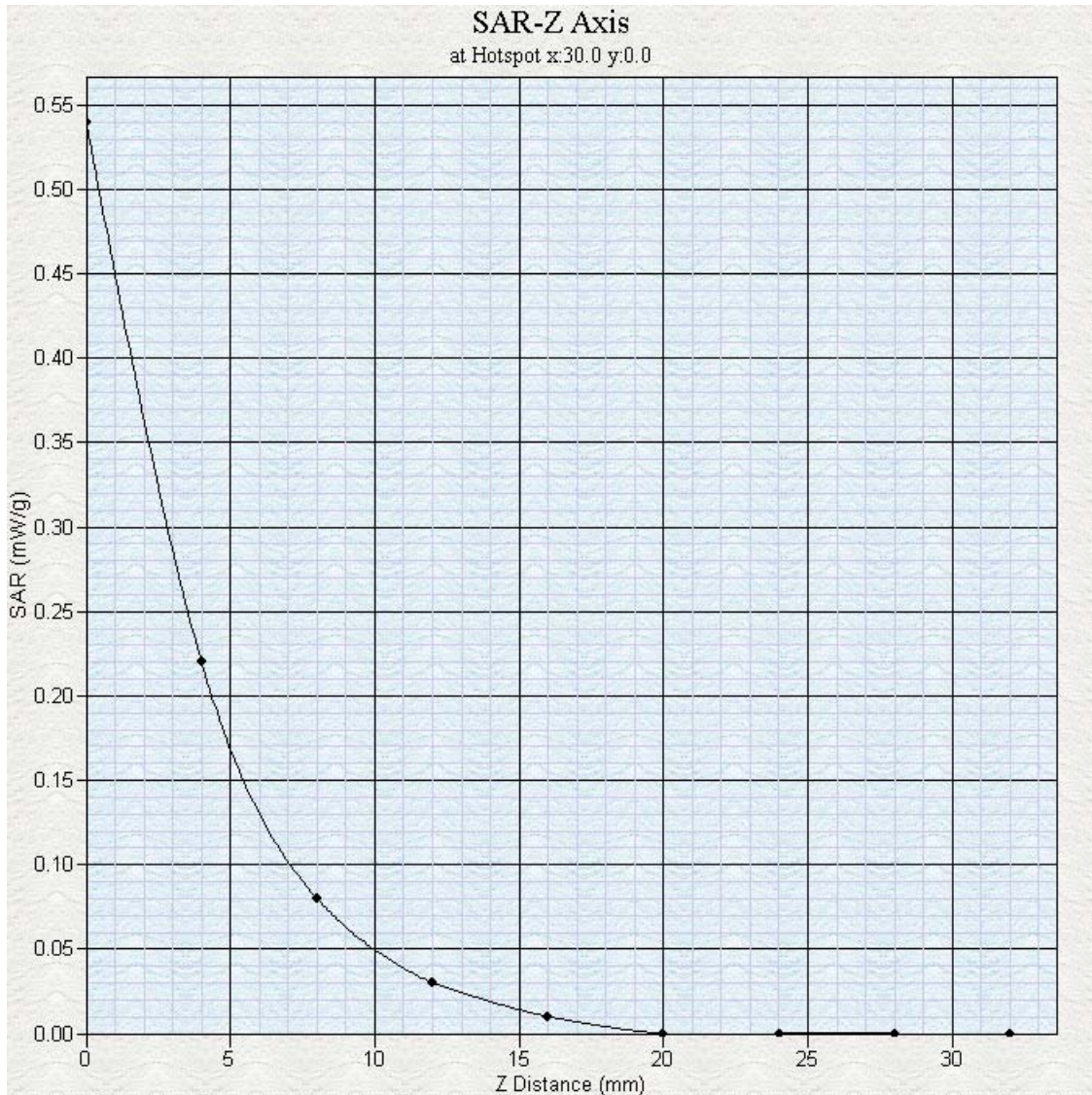


1 gram SAR value : 0.16 W/kg

### Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (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	$\sqrt{3}$	$(\frac{1-cp}{2})^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	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	0.0	rectangular	$\sqrt{3}$	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	4.8	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal (k=2)				20.6	19.1

## Z-Axis Plot



**Appendix B**  
**Probe Calibration Certificate**

Project number: Intel-Dell-WM3A2200BG-5053  
FCC ID: ID:E2K24GBRL



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Canada K2R 1E6  
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AL-065

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www.aprel.com

**NCL CALIBRATION LABORATORIES**

Calibration File No.: CP-339

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 2450 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: 4<sup>th</sup> June 2004

Released on: 4<sup>th</sup> June 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



## 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

<b>Probe Type:</b>	E-Field Probe E-020
<b>Serial Number:</b>	212
<b>Frequency:</b>	2450 MHz
<b>Sensor Offset:</b>	1.56 mm
<b>Sensor Length:</b>	2.5 mm
<b>Tip Enclosure:</b>	Ertalyte*
<b>Tip Diameter:</b>	5 mm
<b>Tip Length:</b>	60 mm
<b>Total Length:</b>	290 mm

\*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

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





### Sensitivity in Body Tissue

**Frequency:** 2450 MHz

**Epsilon:** 50.6 (+/-5%)      **Sigma:** 1.98 S/m (+/-10%)

### ConvF

**Channel X:** 3.3

**Channel Y:** 3.3

**Channel Z:** 3.3

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

### Boundary Effect:

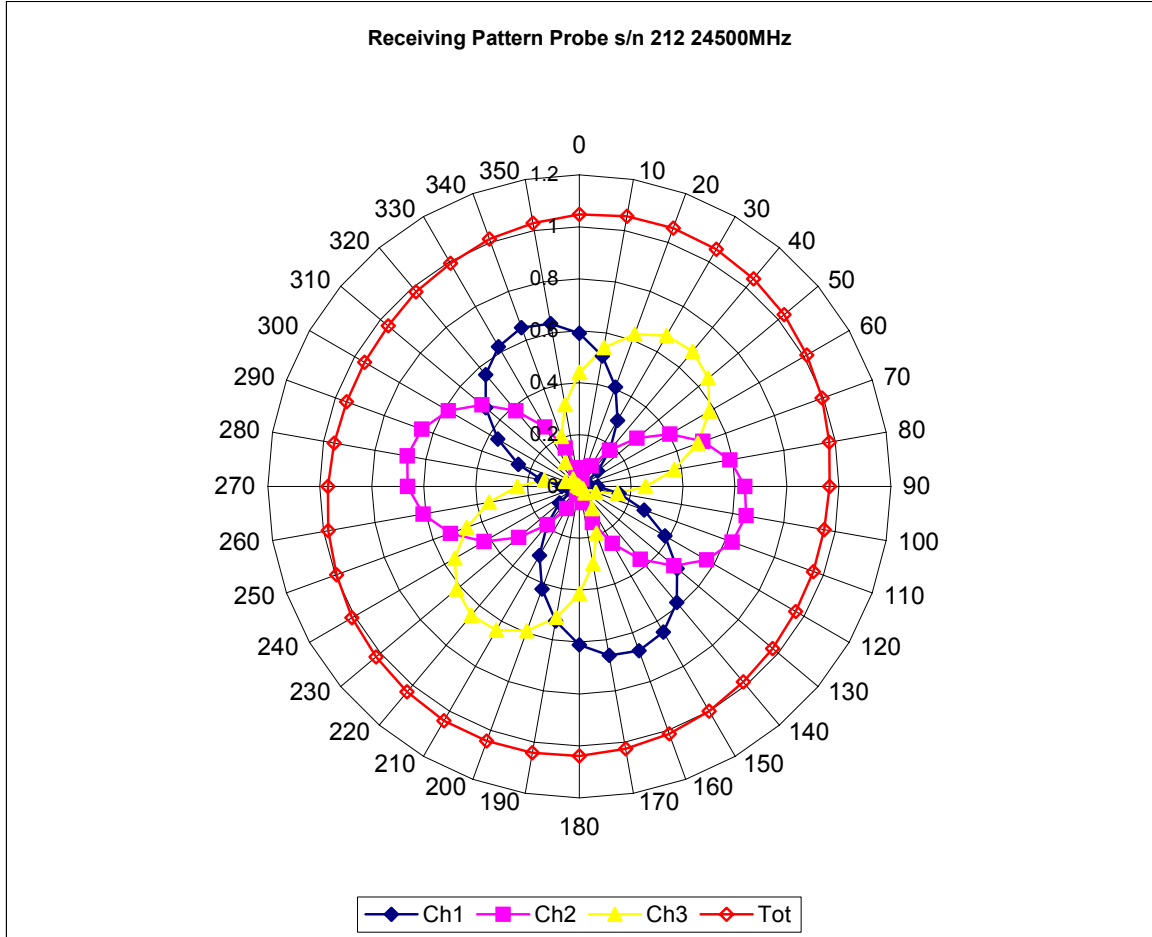
Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.4mm.

### Spatial Resolution:

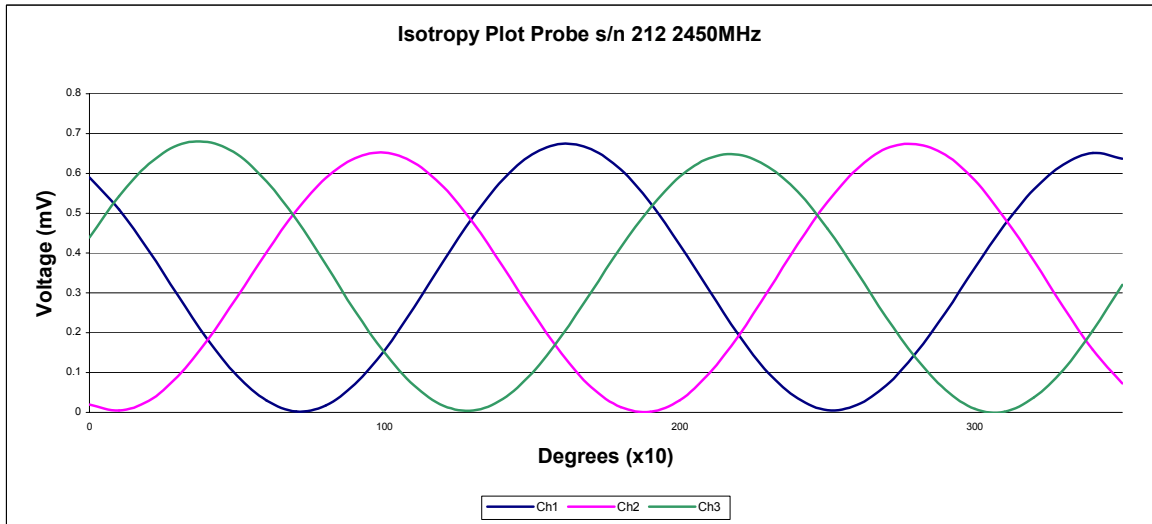
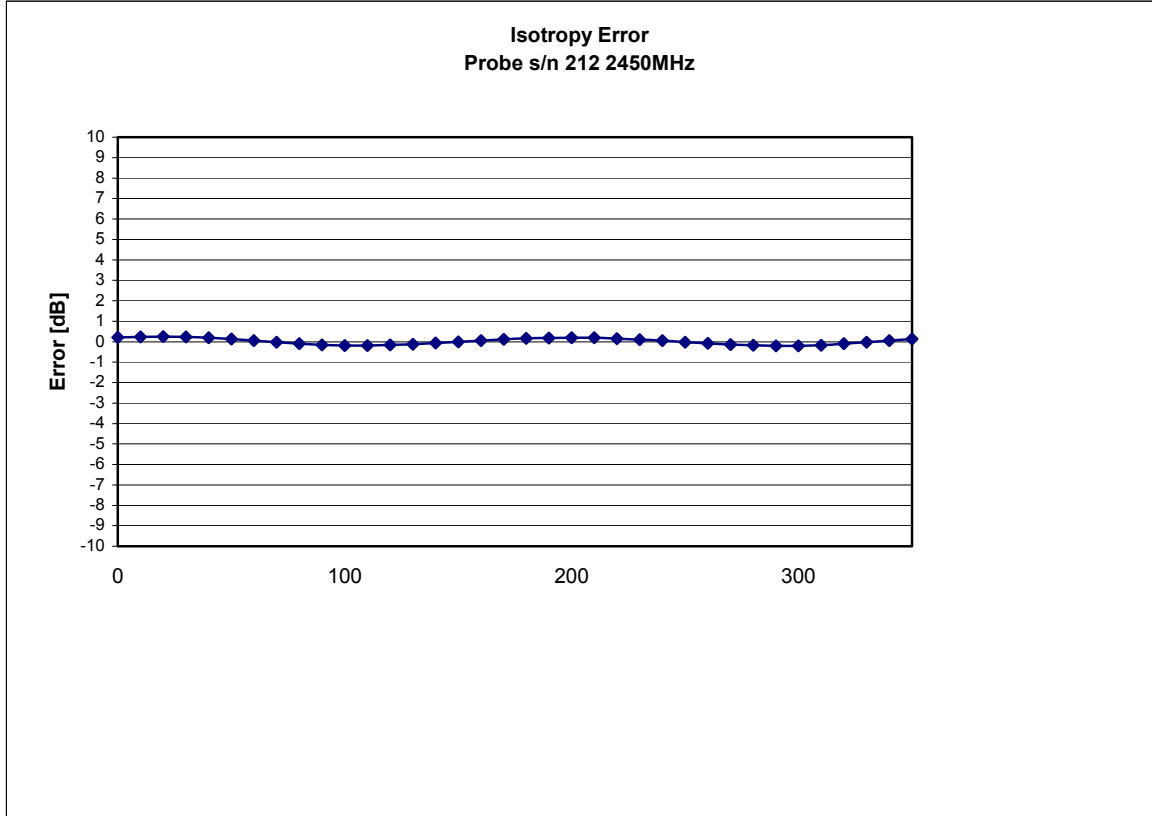
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.



## Receiving Pattern 2450 MHz (Air)



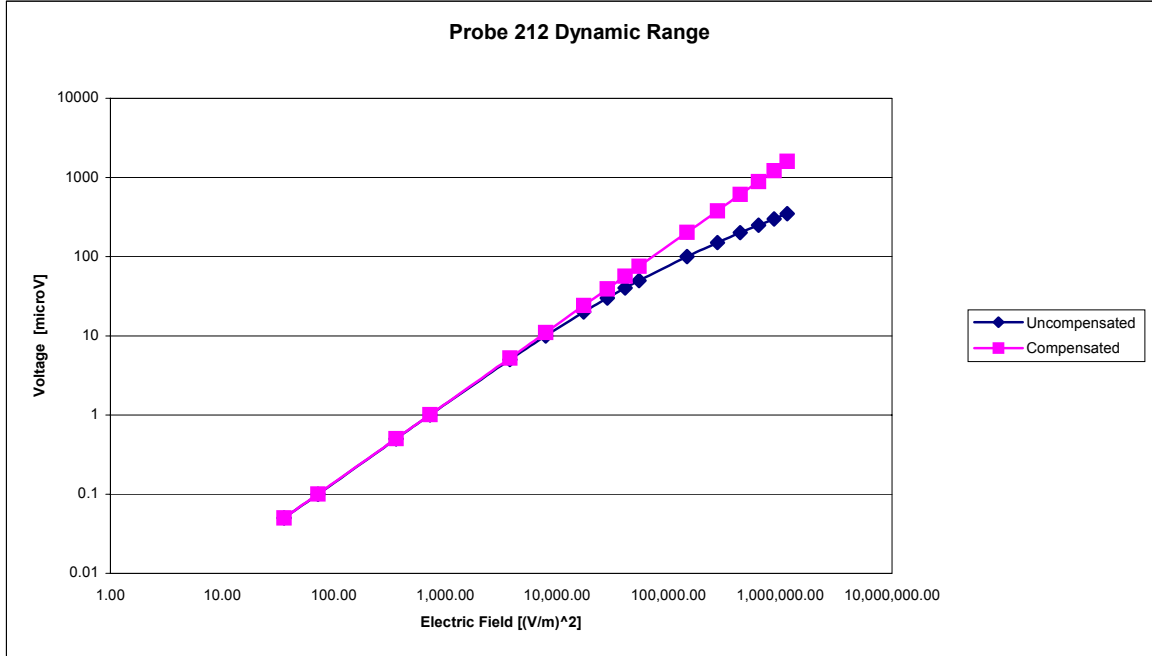
### Isotropy Error 2450 MHz (Air)



**Isotropicity:** 0.10 dB

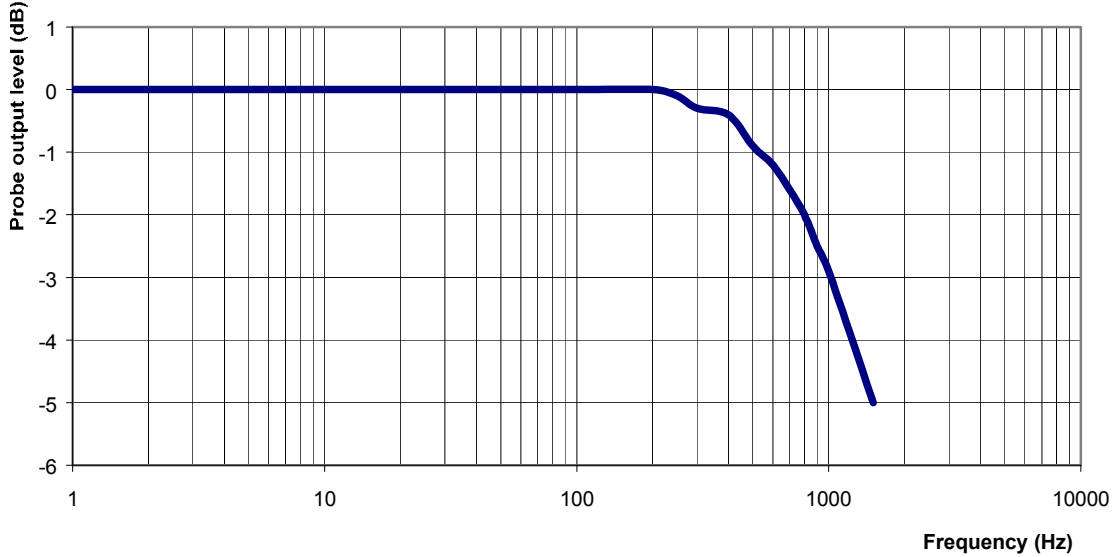


**Dynamic Range**



## 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:** 2450MHz

**Epsilon:** 50.6 (+/-5%)

**Sigma:** 1.98 S/m (+/-10%)

#### ConvF

**Channel X:** 3.3 7%(K=2)

**Channel Y:** 3.3 7%(K=2)

**Channel Z:** 3.3 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%.



## 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.



**Appendix C**  
**Dipole Calibration Certificate**

Project number: Intel-Dell-WM3A2200BG-5053  
FCC ID: ID:E2K24GBRL

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Nepean, Ontario  
Canada K2R 1E6  
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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



### Calibration Results Summary

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

#### Mechanical Dimensions

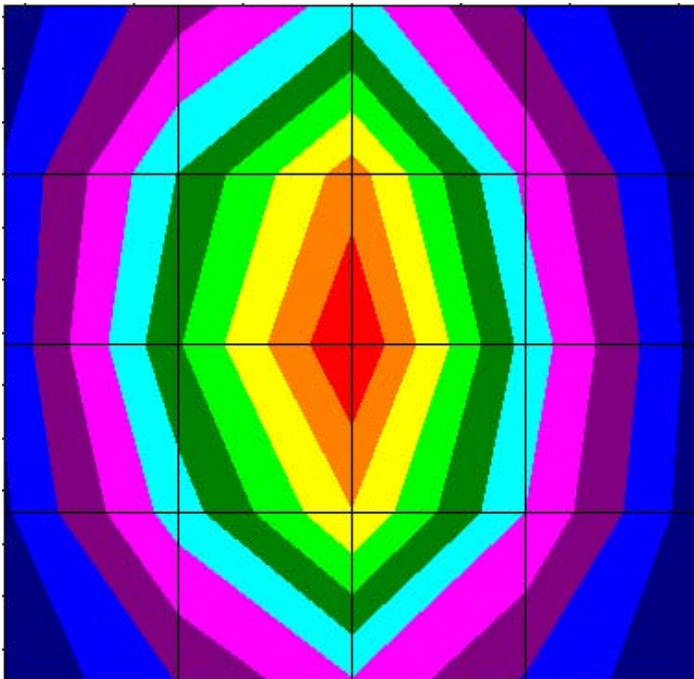
**Length:** 51.7 mm  
**Height:** 30.8 mm

#### 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



## 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

**Dipole Calibration Results**

**Mechanical Verification**

IEEE Length	IEEE Height	Measured Length	Measured Height
47.9 mm	30.4 mm	51.7 mm	30.8 mm

**Tissue Validation**

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



**Electrical Calibration**

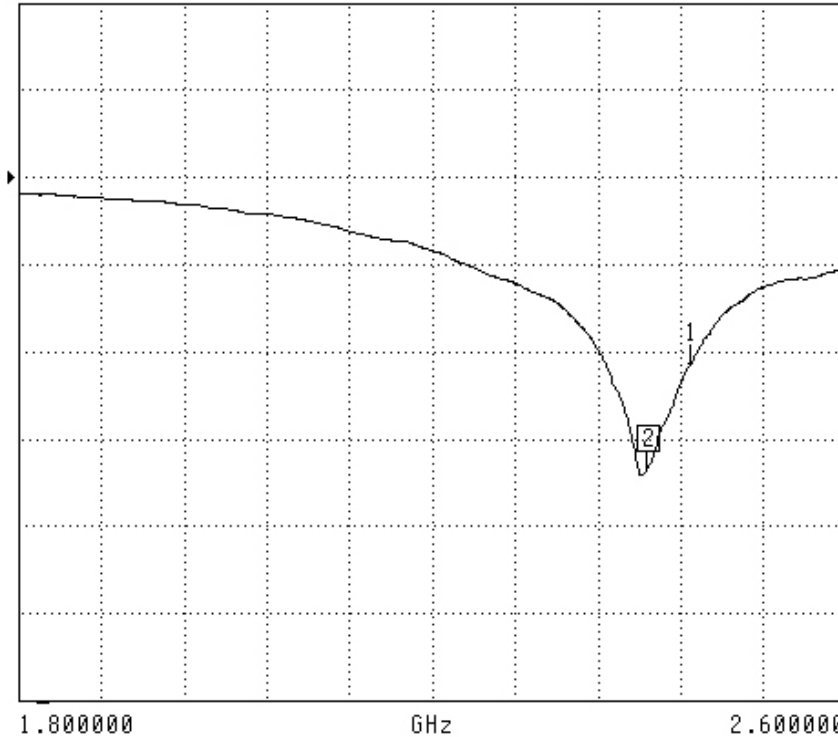
Test	Result	IEEE Value
S11 R/L	-21.4	-21 dB
SWR	1.181U	-
Impedance	46.175 Ω	

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

S11 Parameter Return Loss

S11 FORWARD REFLECTION

LOG MAGNITUDE      REF=0.000 dB      10.000 dB/DIV



CH 1 - S11  
REFERENCE PLANE  
5.1160 mm

MARKER 2  
2.408000 GHz  
-33.566 dB

MARKER TO MAX  
▶ MARKER TO MIN

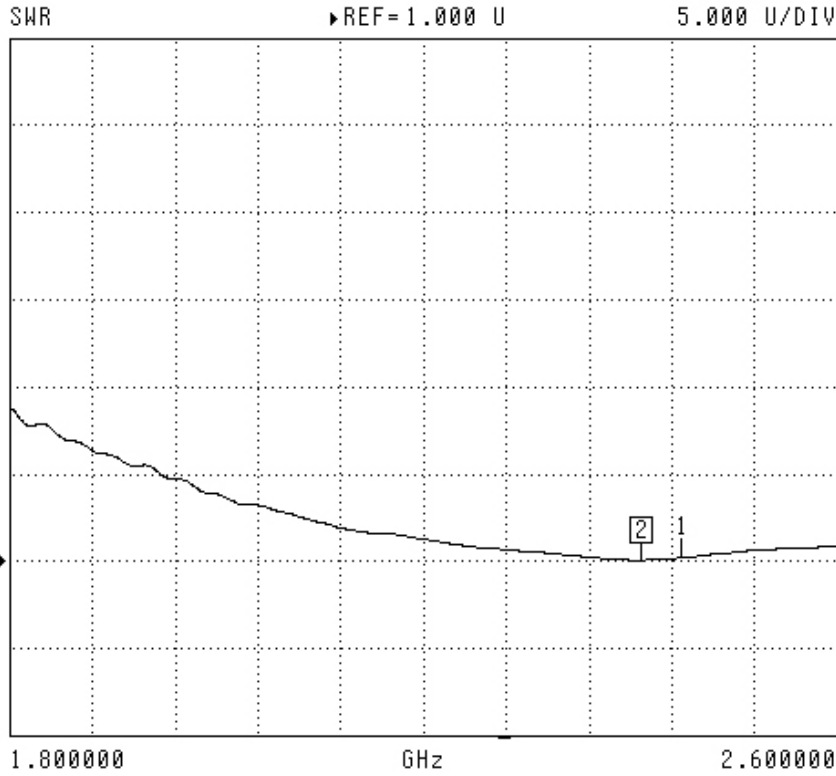
1 2.450000 GHz  
-21.377 dB

MARKER READOUT  
FUNCTIONS



## SWR

S11 FORWARD REFLECTION



CH 1 - S11  
REFERENCE PLANE  
5.1160 mm

MARKER 2  
2.411000 GHz  
1.049 U

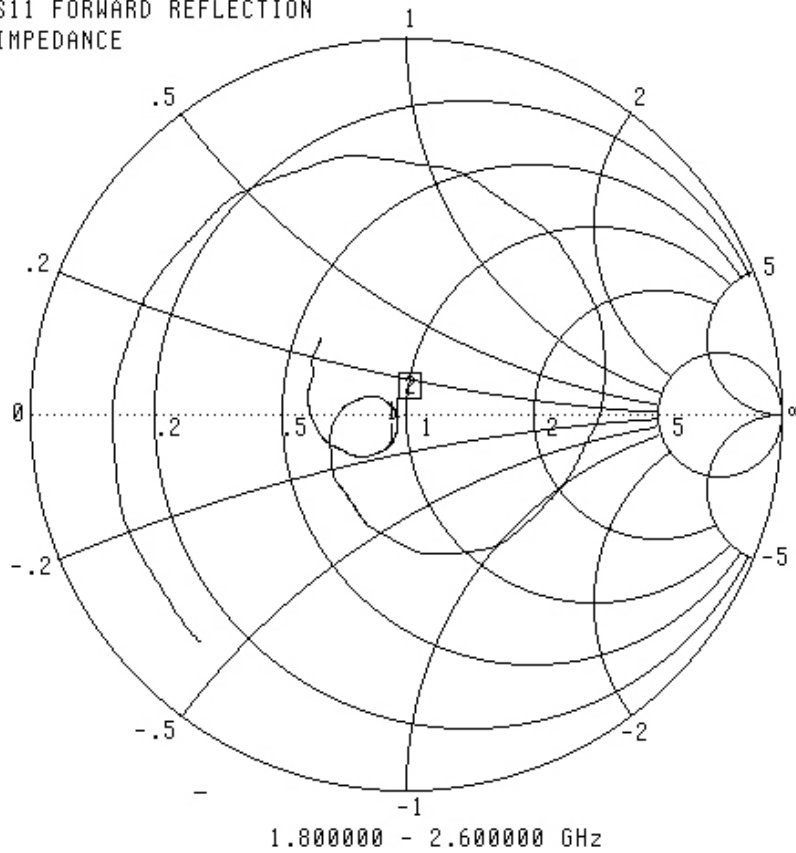
MARKER TO MAX  
▶ MARKER TO MIN  
**1** 2.450000 GHz  
1.181 U

MARKER READOUT  
FUNCTIONS



## Smith Chart Dipole Impedance

S11 FORWARD REFLECTION  
IMPEDANCE



CH 1 - S11  
REFERENCE PLANE  
5.1160 mm

MARKER 2  
2.411000 GHz  
48.080 Ω  
-1.171 jΩ

MARKER TO MAX  
▶ MARKER TO MIN

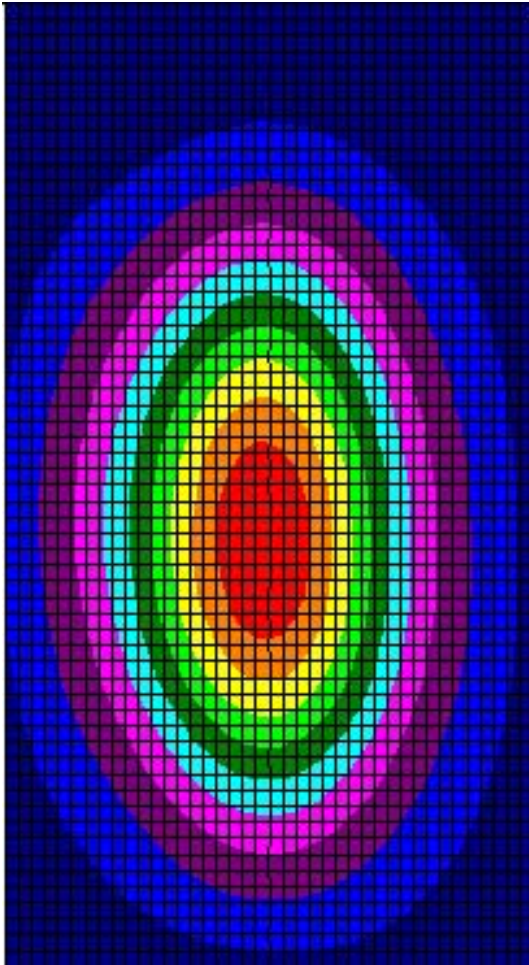
1 2.450000 GHz  
46.175 Ω  
-7.199 jΩ

MARKER READOUT  
FUNCTIONS

### 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.





## 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

