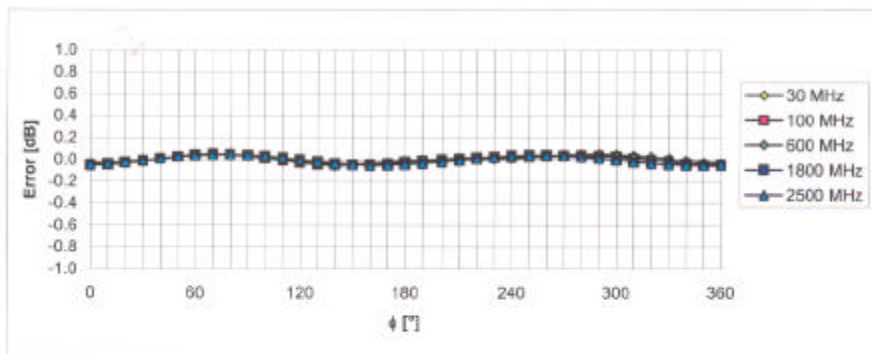
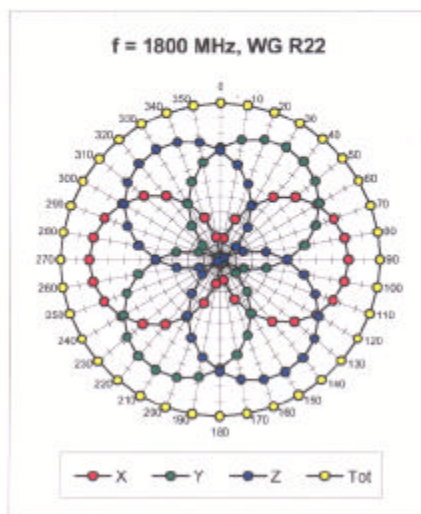
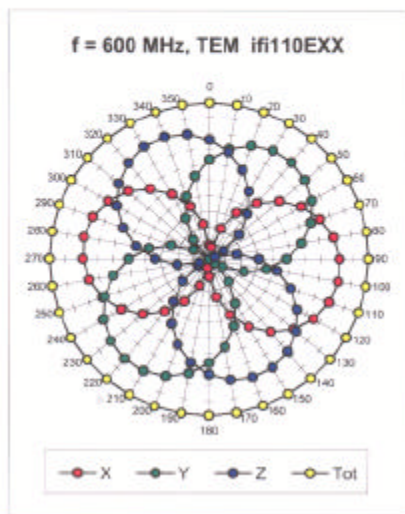


ET3DV6 SN:1604

March 18, 2005

Receiving Pattern (ϕ), $\theta = 0^\circ$ Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

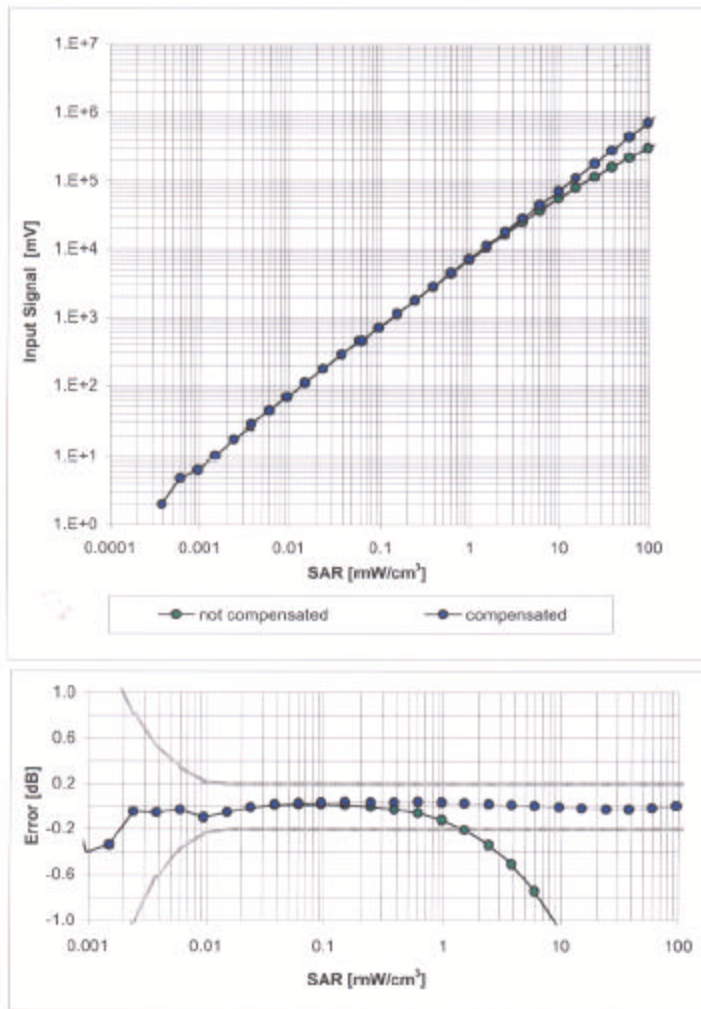
Certificate No: ET3-1604_Mar05

Page 6 of 9

ET3DV6 SN:1604

March 18, 2005

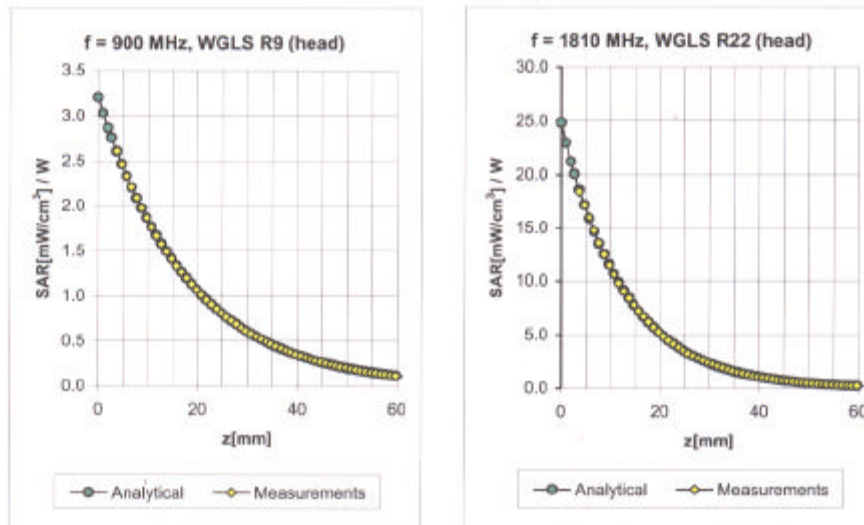
Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800$ MHz)

Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6 SN:1604

March 18, 2005

Conversion Factor Assessment

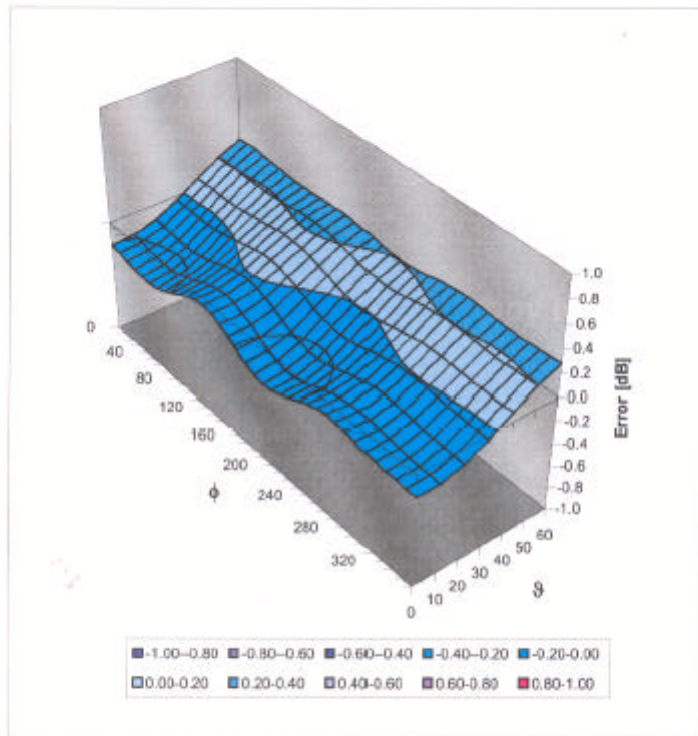


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
300	± 50 / ± 100	Head	45.3 ± 5%	0.87 ± 5%	0.10	1.14	8.44 ± 13.3% (k=2)
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.10	1.10	8.10 ± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.63	1.78	6.62 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.58	2.40	5.19 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.66	2.25	4.58 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.06	1.40	7.54 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.53	2.02	6.27 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.75	4.79 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.70	2.13	4.24 ± 11.8% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1604

March 18, 2005

Deviation from Isotropy in HSLError (ϕ , θ), $f = 900$ MHzUncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

Schmid & Partner Engineering AG

s p e a g

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, <http://www.speag.com>

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1604

Place of Assessment:

Zurich

Date of Assessment:

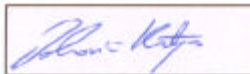
March 21, 2005

Probe Calibration Date:

March 18, 2005

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



ET3DV6-SN:1604

Page 1 of 2

March 21, 2005

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, <http://www.speag.com>

Dosimetric E-Field Probe ET3DV6 SN:1604Conversion factor ($\pm$ standard deviation)**f = 150 MHz** ConvF **9.0 $\pm$ 10 %**

$\epsilon_r = 52.3 \pm 5 \%$
 $\sigma = 0.76 \pm 5 \%$ mho/m
(head tissue)

f = 150 MHz ConvF **8.6 $\pm$ 10 %**

$\epsilon_r = 61.9 \pm 5 \%$
 $\sigma = 0.80 \pm 5 \%$ mho/m
(body tissue)

f = 300 MHz ConvF **7.9 $\pm$ 9 %**

$\epsilon_r = 58.2 \pm 5 \%$
 $\sigma = 0.92 \pm 5 \%$ mho/m
(body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No: DC-266
Project Number: BACL-CAL2450-3986

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.

BACL Validation Dipole

Manufacturer: APREL Laboratories

Part number: D-2450-S-1

Frequency: 2450 MHz

Serial No: BCL-141

Customer: Bay Area Compliance Laboratory

Calibrated: 4th March 2005
Released on: 4th March 2005

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E8

Division of APREL Lab.
TEL: (513) 820-4988
FAX: (513) 820-4182

NCL Calibration Laboratories

Division of APREL Laboratories.

Conditions

Dipole BCL-141 was received from customer in good condition for re-calibration, SMA connector required cleaning prior to calibration.

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

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

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



Stuart Nicol
Director Product Development



D. Brooks
Member of Engineering Staff
(Calibration Engineer)

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NCL Calibration Laboratories

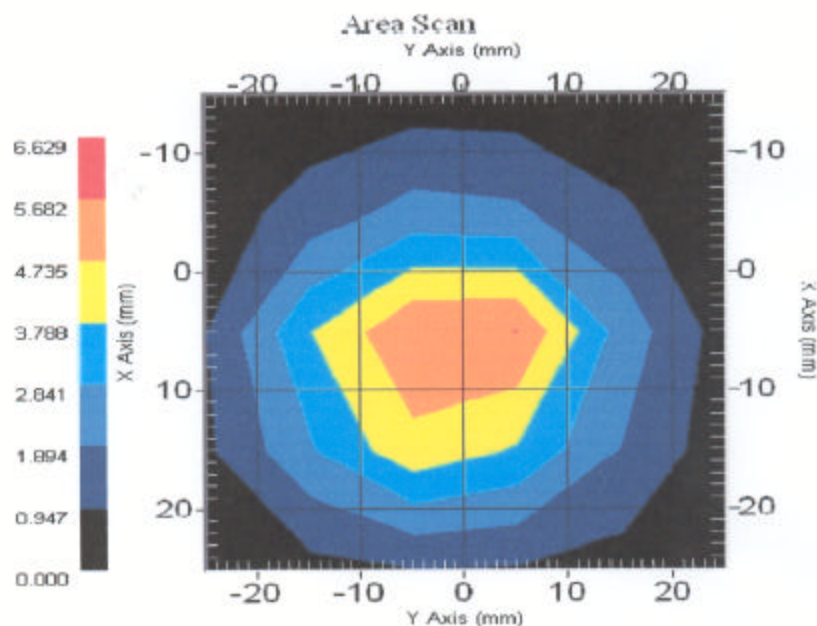
Division of APREL Laboratories.

Calibration Results Summary

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

Mechanical Dimensions**Length:** 51.5 mm**Height:** 30.4 mm**Electrical Specification****SWR:** 1.09 U to 1.38 U**Return Loss:** -27.5 dB to -15.9 dB**Impedance:** 47.9 Ω to 60.8 Ω **System Validation Results**

Frequency	1 Gram	10 Gram	Peak
2450 MHz	5.31	2.44	10.18



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NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole BCL-141. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. 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 ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure
SSI-TP-016 Tissue 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"

Conditions

Dipole BCL-141 was received from customer in good condition for re-calibration, SMA connector required cleaning prior to calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

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NCL Calibration Laboratories

Division of APREL Laboratories.

Dipole Calibration Results**Mechanical Verification**

APREL Length	APREL Height	Measured Length	Measured Height
51.5 mm	30.4 mm	51.6 mm	30.5 mm

Tissue Validation

Head Tissue 2450 MHz	Measured
Dielectric constant, ϵ_r	39.2
Conductivity, σ [S/m]	1.80

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NCL Calibration Laboratories

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Electrical Calibration

Test	Result
S11 R/L	-27.5 dB to -15.9 dB
SWR	1.09 U to 1.38 U
Impedance	47.9 Ω to 60.8 Ω

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

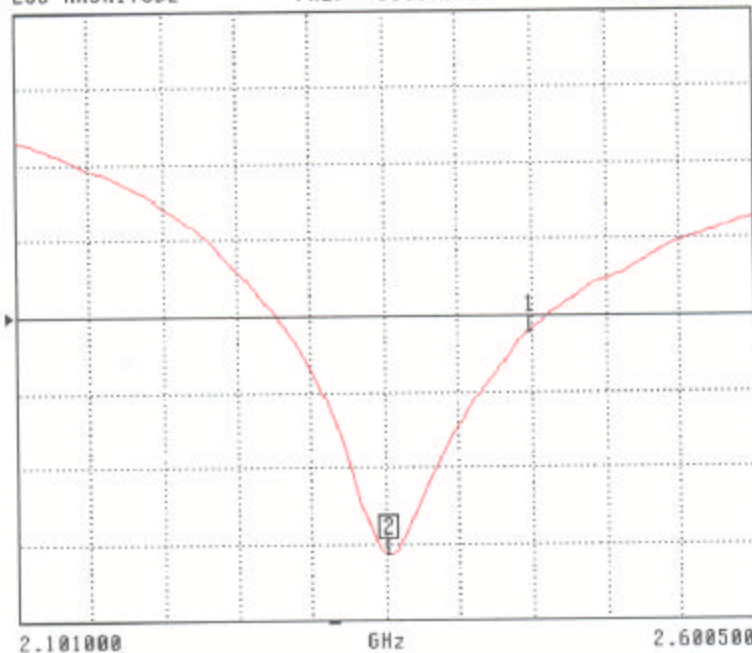
S11 Parameter Return Loss

S22 REVERSE REFLECTION

LOG MAGNITUDE

REF = -15.000 dB

4.000 dB/DIV



CH 4 - S22
REFERENCE PLANE
0.0000 mm

MARKER 2
2.353000 GHz
-27.537 dB

MARKER TO MAX
MARKER TO MIN

1 2.449750 GHz
-15.866 dB

MARKER READOUT
FUNCTIONS

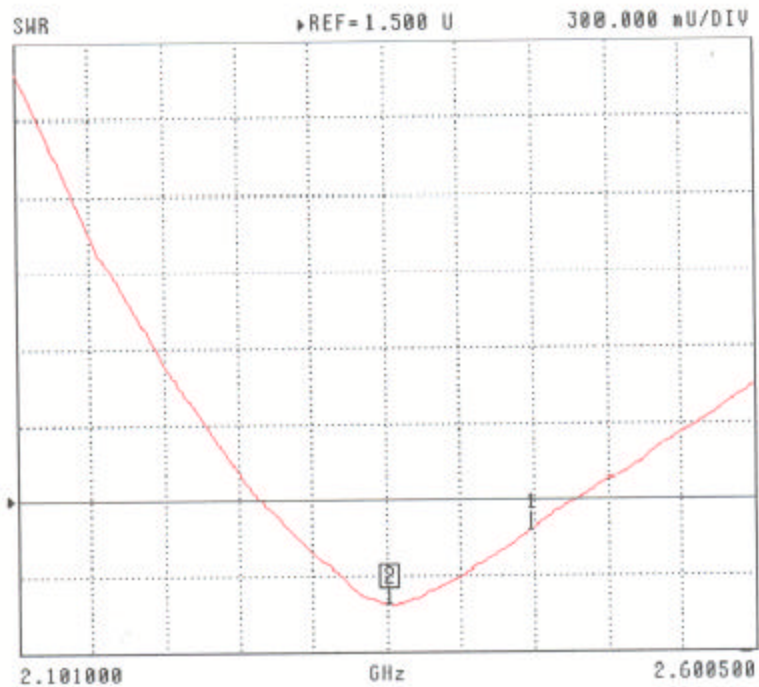
6

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NCL Calibration Laboratories
Division of APREL Laboratories.

SWR

S22 REVERSE REFLECTION



CH 4 - S22
REFERENCE PLANE
0.0000 mm

MARKER 2
2.353000 GHz
1.090 U

MARKER TO MAX
▶ MARKER TO MIN

1 2.449750 GHz
1.380 U

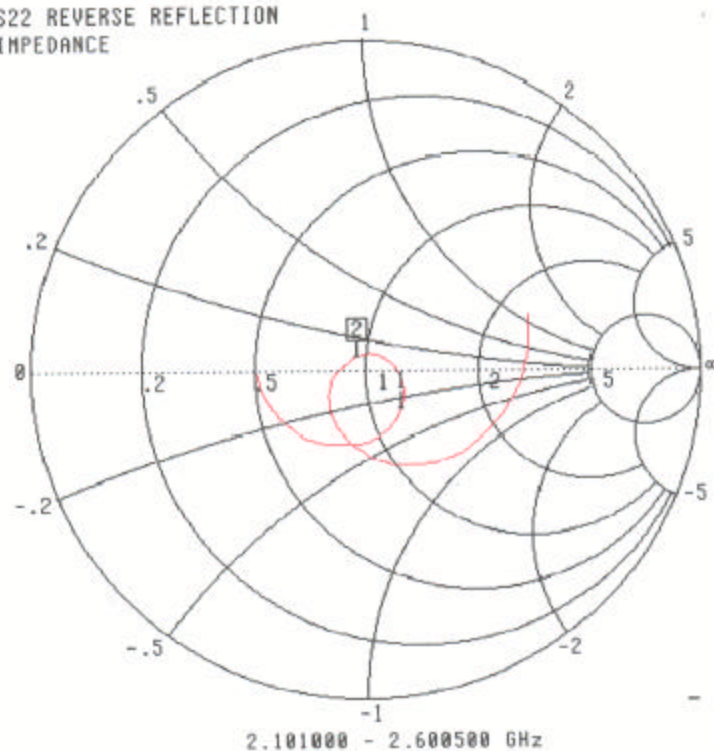
MARKER READOUT
FUNCTIONS

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NCL Calibration Laboratories

Division of APREL Laboratories.

Smith Chart Dipole ImpedanceS22 REVERSE REFLECTION
IMPEDANCECH 4 - S22
REFERENCE PLANE
0.0000 mmMARKER 2
2.353000 GHz
47.949 Ω
3.624 j Ω MARKER TO MAX
▶ MARKER TO MIN1 2.449750 GHz
60.783 Ω
-14.651 j Ω - MARKER READOUT
FUNCTIONS

8

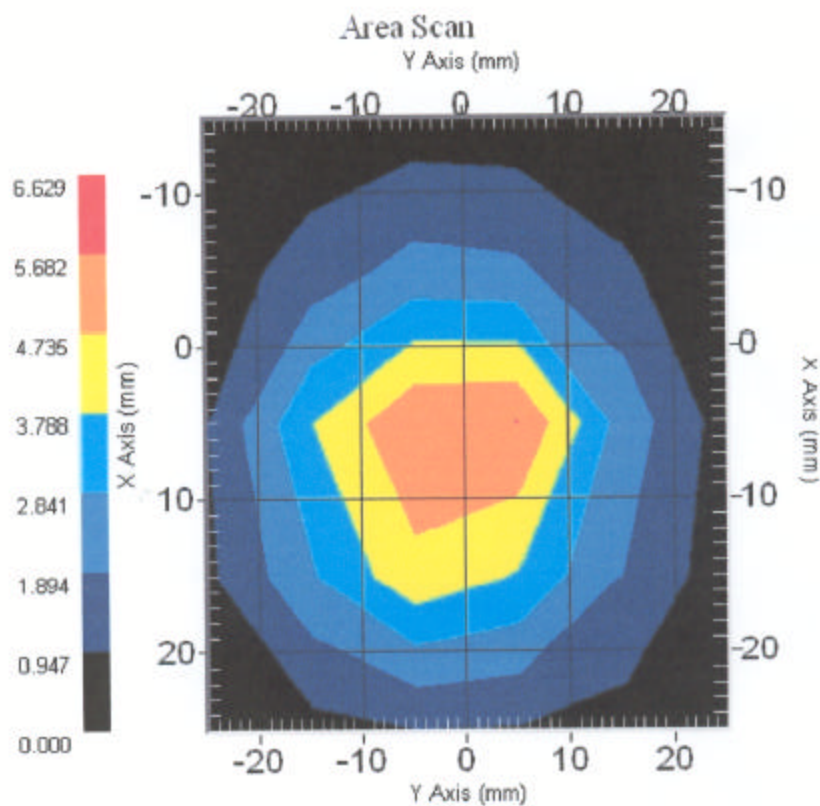
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NCL Calibration Laboratories

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System Validation Results Using the Electrically Calibrated Dipole

Head Tissue Frequency	1 Gram	10 Gram	Peak Above Feed Point
2450 MHz	5.31	2.44	10.18



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NCL Calibration Laboratories

Division of APREL Laboratories.

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 D - TEST SYSTEM VERIFICATIONS SCANS

Liquid Measurement Result

2005-06-29

<i>Simulant</i>	<i>Freq [MHz]</i>	<i>Parameters</i>	<i>Liquid Temp [°C]</i>	<i>Target Value</i>	<i>Measured Value</i>	<i>Deviation</i>	<i>Limits [%]</i>
<i>Body</i>	<i>2450</i>	<i>e_r</i>	<i>22.0</i>	<i>52.7</i>	<i>50.7</i>	<i>-3.79</i>	<i>±5</i>
		<i>s</i>	<i>22.0</i>	<i>1.95</i>	<i>2.02</i>	<i>3.59</i>	<i>±5</i>
		<i>1g SAR</i>	<i>22.0</i>	<i>56.84</i>	<i>55.9</i>	<i>-1.65</i>	<i>±10</i>

ϵ_r = relative permittivity, σ = conductivity and $\rho=1000\text{kg/m}^3$

Date/Time: 6/29/2005 9:21:34 AM ; Date/Time: 6/29/2005 9:26:18 AM

Test Laboratory: Bay Area Compliance Lab Corp.

050622_ET_1604_SystemValidationCheck_D2437MHz_Body**DUT: Dipole 2450 MHz;**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $s = 2.02$ mho/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(4.24, 4.24, 4.24); Calibrated: 3/18/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 6/1/2004
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

d=10mm, Pin=1W/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 72.0 mW/g

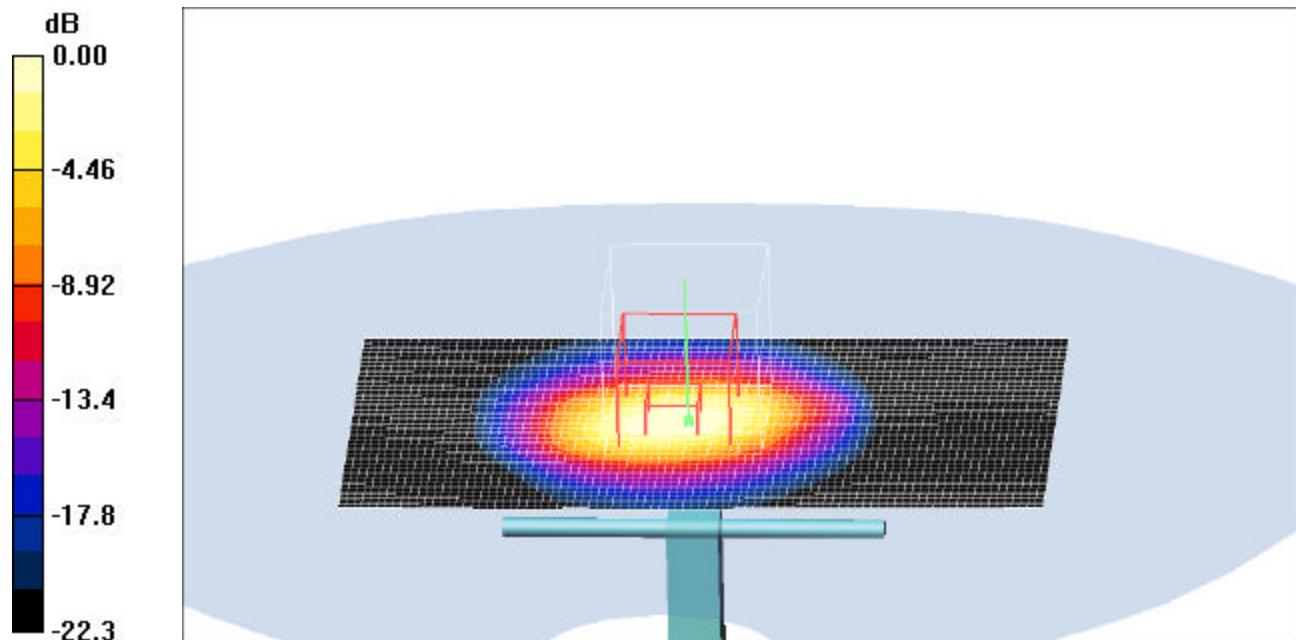
d=10mm, Pin=1W/Zoom Scan Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 183.9 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 124.4 W/kg

SAR(1 g) = 55.9 mW/g; SAR(10 g) = 25.9 mW/g

Maximum value of SAR (measured) = 62.4 mW/g



0 dB = 62.4mW/g

APPENDIX E - EUT SCANS

Date/Time: 6/29/2005 10:38:10 AM ; Date/Time: 6/29/2005 10:49:49 AM

Test Laboratory: Bay Area Compliance Lab Corp.

Bright Star 802.11B_Body

DUT: Bright Star; Type: Sample; Serial: sample# C0504-00075

Communication System: 802.11B; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2437$ MHz; $s = 2.02$ mho/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(4.24, 4.24, 4.24); Calibrated: 3/18/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn456; Calibrated: 6/1/2004
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

TOUCH Body position - 8.02.11b/Area Scan (101x141x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (interpolated) = 0.906 mW/g

TOUCH Body position - 8.02.11b/Z Scan (1x1x21): Measurement grid: $dx=20$ mm, $dy=20$ mm, $dz=10$ mm

Maximum value of SAR (interpolated) = 0.354 mW/g

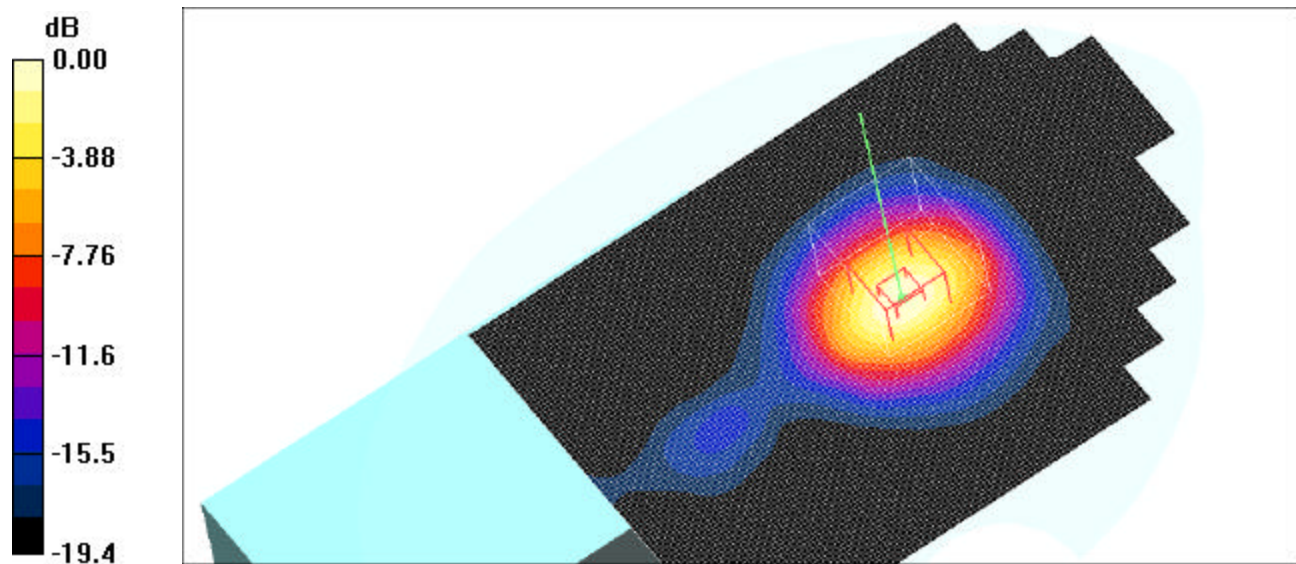
TOUCH Body position - 8.02.11b/Zoom Scan(5x5x5): Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 5.00 V/m; Power Drift = -0.084 dB

Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.790 mW/g; SAR(10 g) = 0.401 mW/g

Maximum value of SAR (measured) = 0.898 mW/g



0 dB = 0.898mW/g

Plot #1

Date/Time: 6/29/2005 9:47:59 AM ; Date/Time: 6/29/2005 9:58:55 AM

Test Laboratory: Bay Area Compliance Lab Corp.

Bright Star 802.11G_Body**DUT: Bright Star; Type: Sample; Serial: sample#C0504-00075**

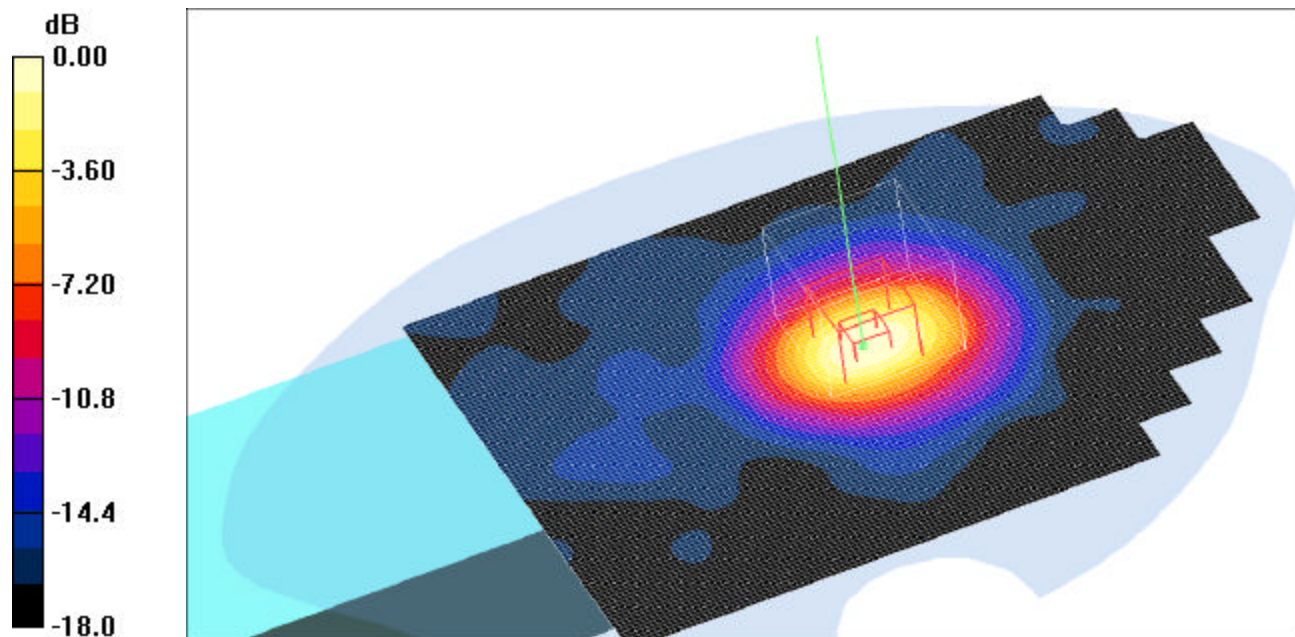
Communication System: 802.11G; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2412$ MHz; $s = 1.95$ mho/m; $\epsilon_r = 50.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(4.24, 4.24, 4.24); Calibrated: 3/18/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn456; Calibrated: 6/1/2004
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

TOUCH Body position - 8.02.11G 2/Area Scan (101x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.299 mW/g**TOUCH Body position - 8.02.11G 2/Z Scan 2 (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=10mm
Maximum value of SAR (interpolated) = 0.092 mW/g**TOUCH Body position - 8.02.11G 2/Zoom Scan(5x5x5):** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.94 V/m; Power Drift = -0.315 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.250 mW/g; SAR(10 g) = 0.136 mW/g
Maximum value of SAR (measured) = 0.290 mW/g

0 dB = 0.290mW/g

Plot #2

APPENDIX F – CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Test equipment

Hewlett Packard HP8564E Spectrum Analyzer, Calibration Due Date: 2005-10-04.

Hewlett Packard HP 7470A Plotter, Calibration not required.

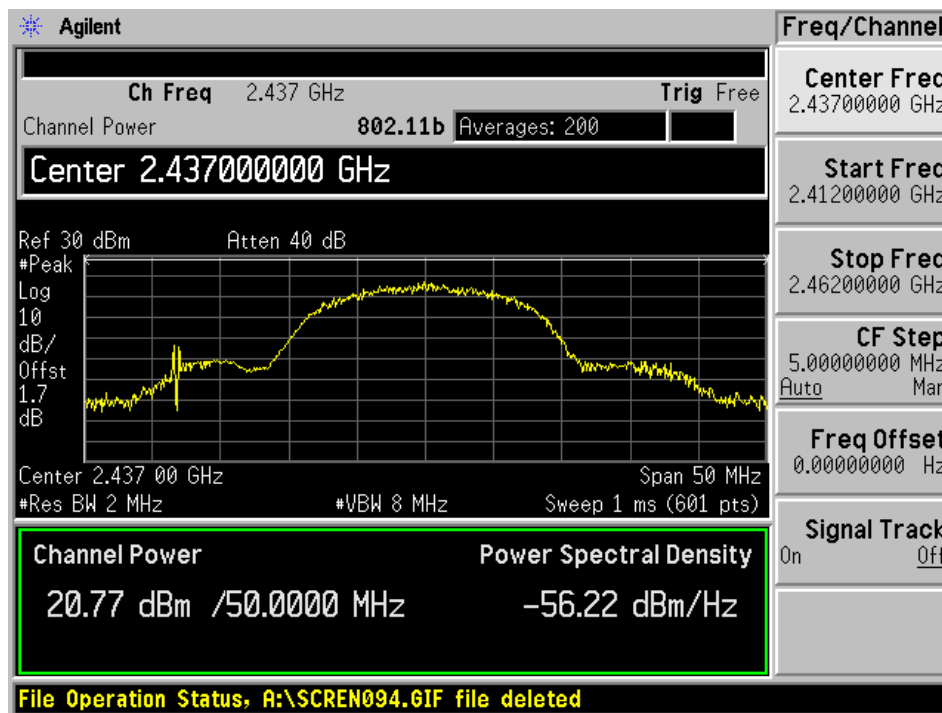
A.H. Systems SAS200 Horn Antenna, Calibration Due Date: 2005-05-31

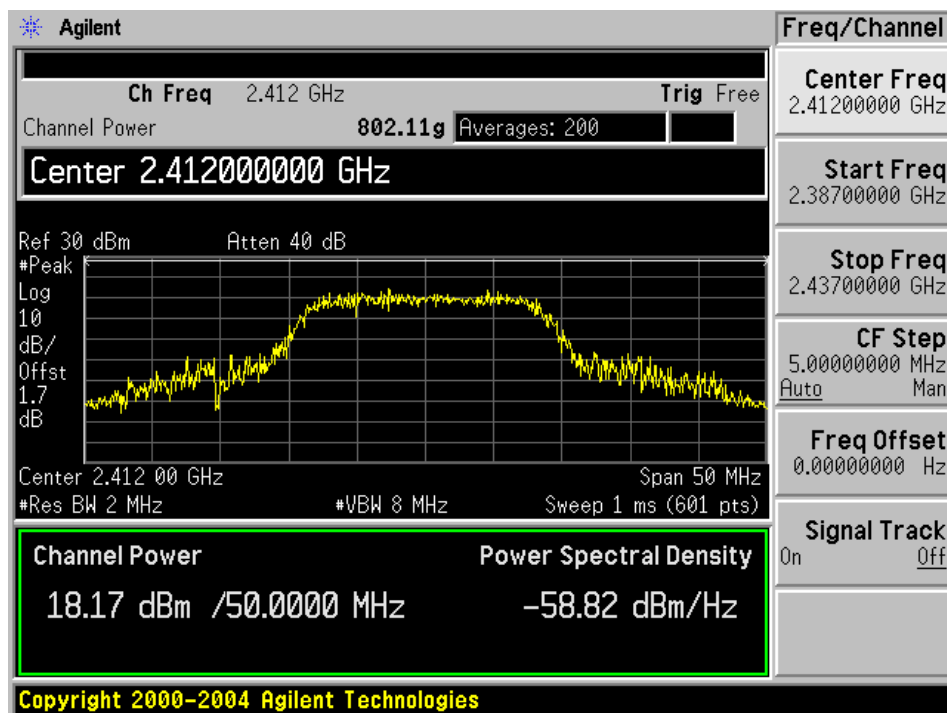
Com-Power AB-100 Dipole Antenna, Calibration Due Date: 2005-09-05

Test Results

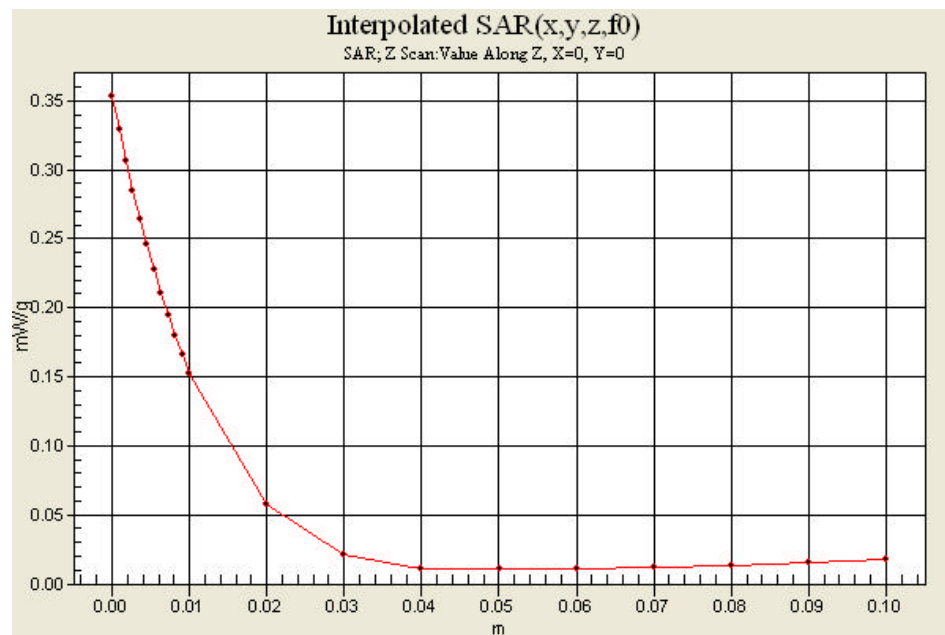
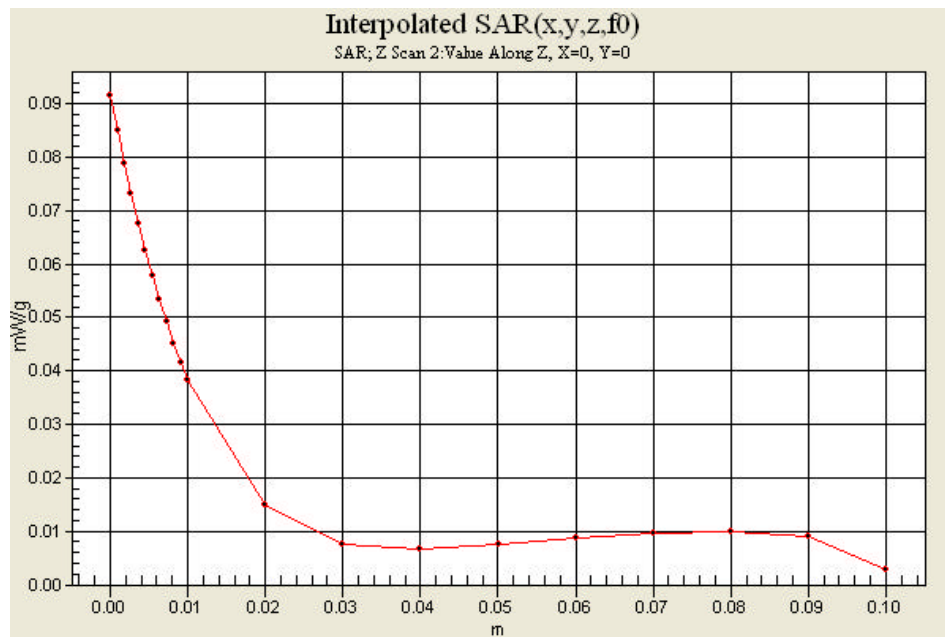
Frequency (MHz)	Output Power in dBm	Output Power in W
2437	20.77	0.119
2412	18.17	0.066

Please refer to the following plots.





APPENDIX G – Z-AXIS PLOT



APPENDIX H – EUT TEST POSITION PHOTOS

Body Touch Setup Photo



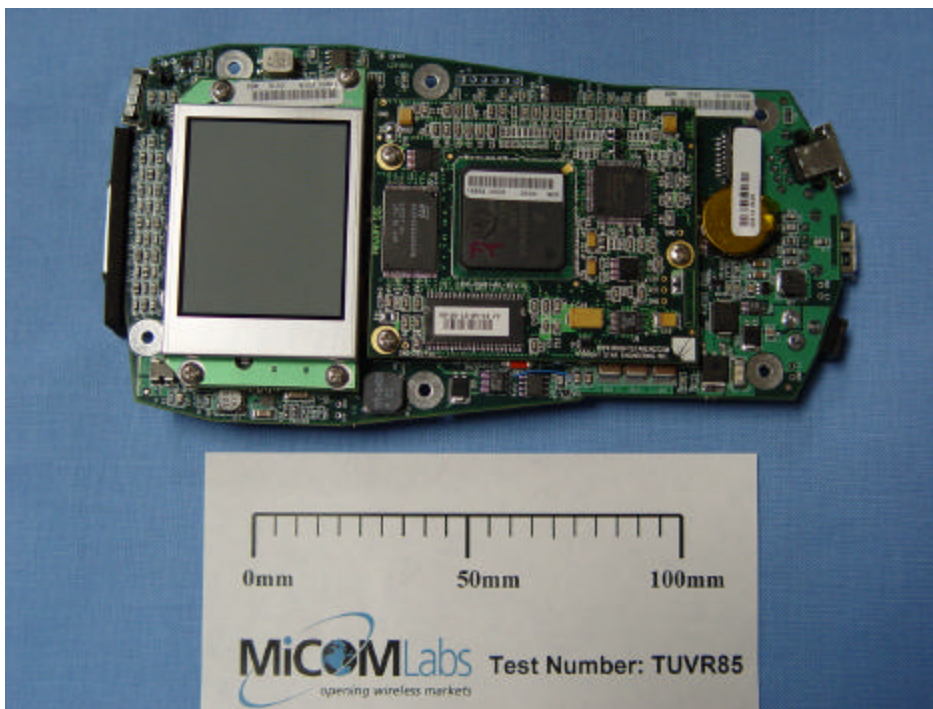
APPENDIX I – EUT & ACCESSORIES PHOTOS

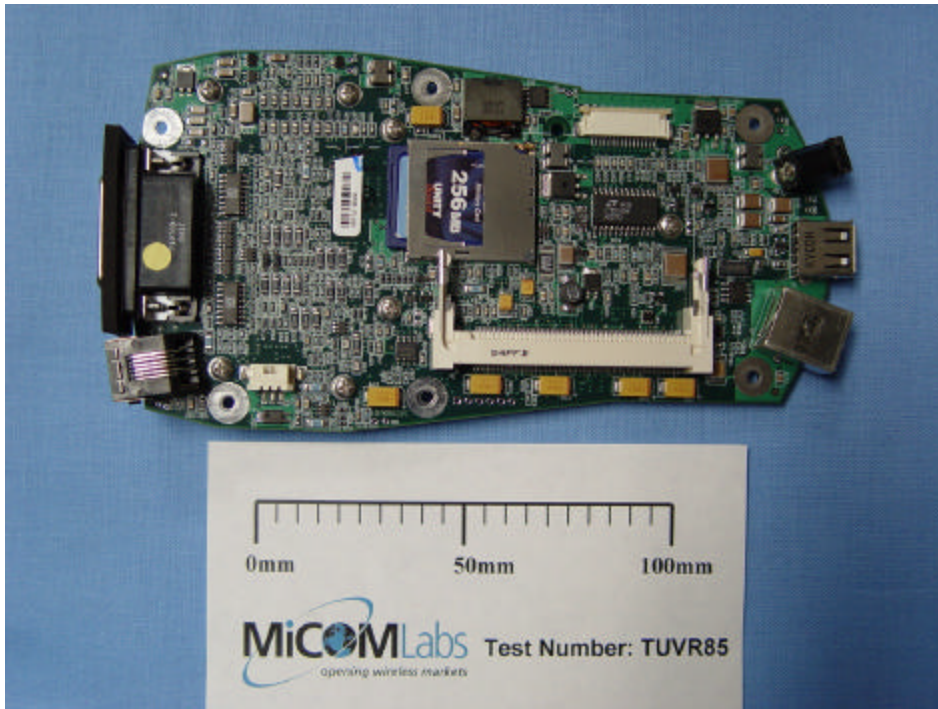
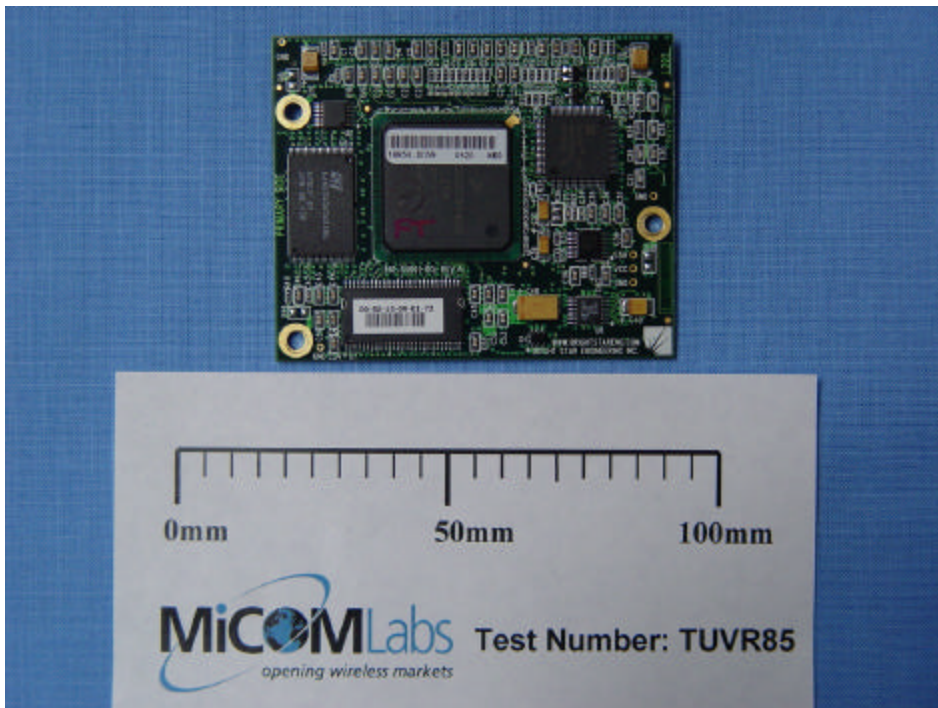
EUT – Front View

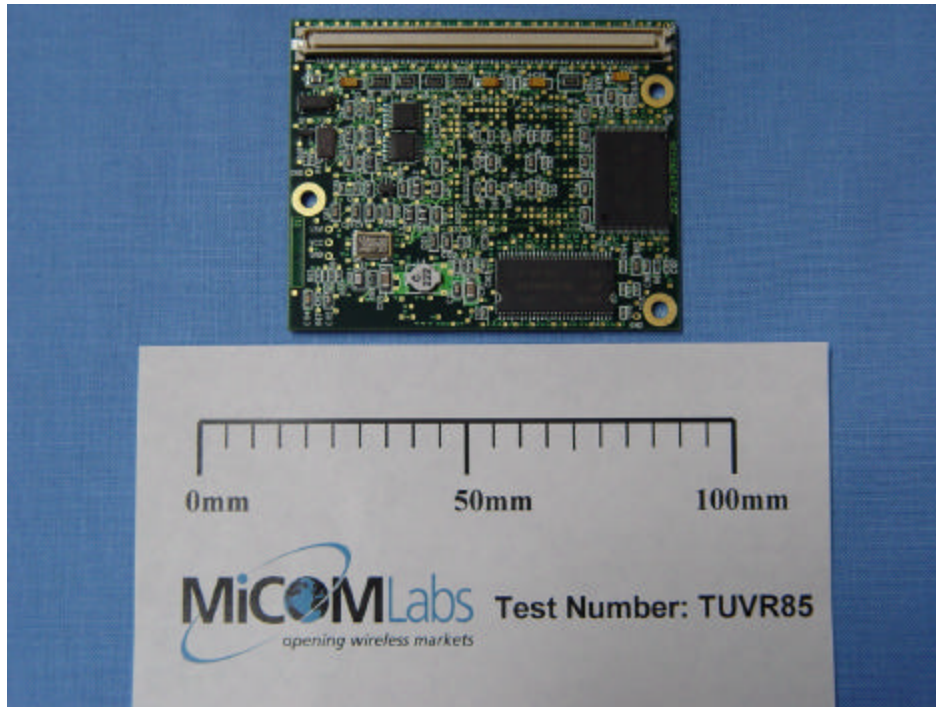
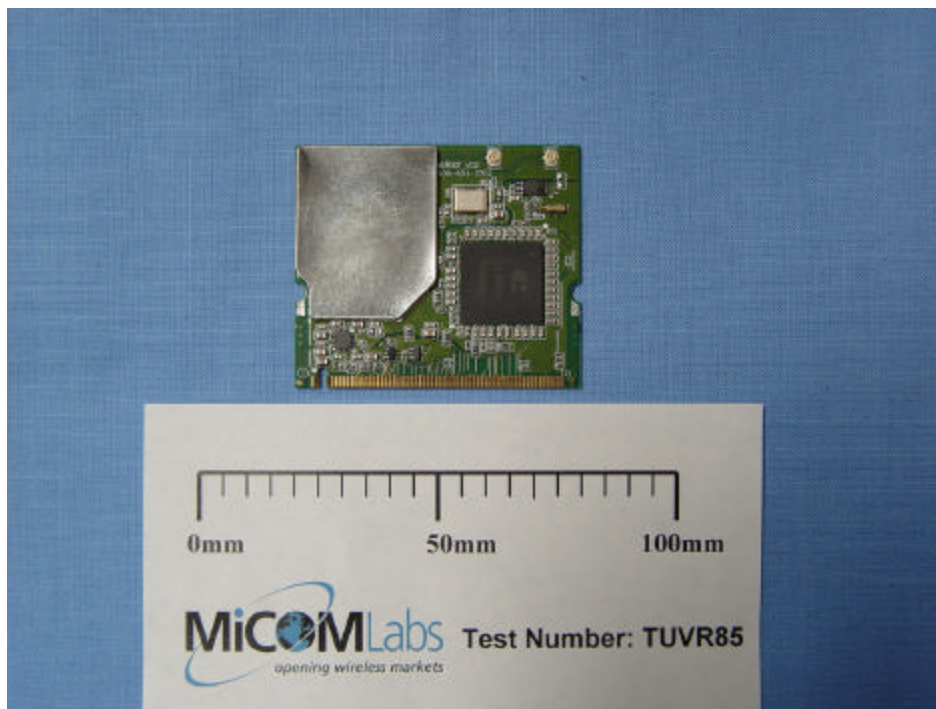


EUT – Rear View

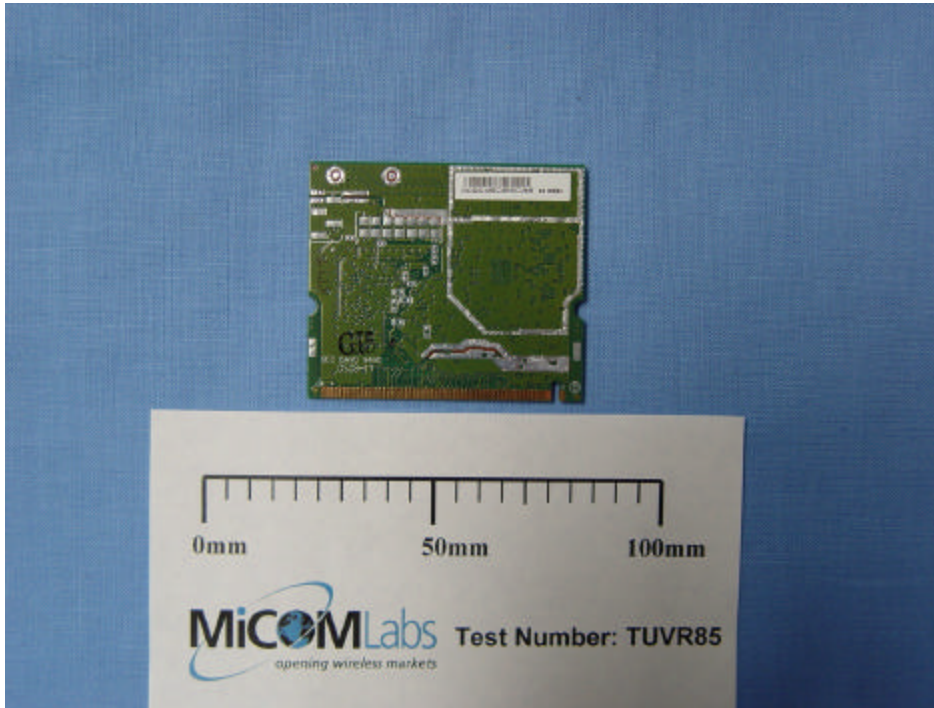


EUT – Cover Off View**EUT – Main Board with LCD Top View**

EUT – Main Board Lower Side View**EUT – Power Engine Top View**

EUT – Power Engine Lower Side View**EUT – Mini PCI Wireless Card Top View**

EUT – Mini PCI Wireless Card Lower Side View



APPENDIX J - INFORMATIVE REFERENCES

- [1] Federal Communications Commission, "Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.
- [2] David L. Means Kwok Chan, Robert F. Cleveland, "Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, Office of Engineering & Technology, Washington, DC, 1997.
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- [4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetric evaluation of mobile communications equipment with known precision", IEEE Transactions on Communications, vol. E80-B, no. 5, pp. 645-652, May 1997.
- [5] CENELEC, "Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15-17, 1997, pp. 120-24.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp. 172-175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard Kuhn, and Niels Kuster, "The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.
- [10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, "The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.
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