

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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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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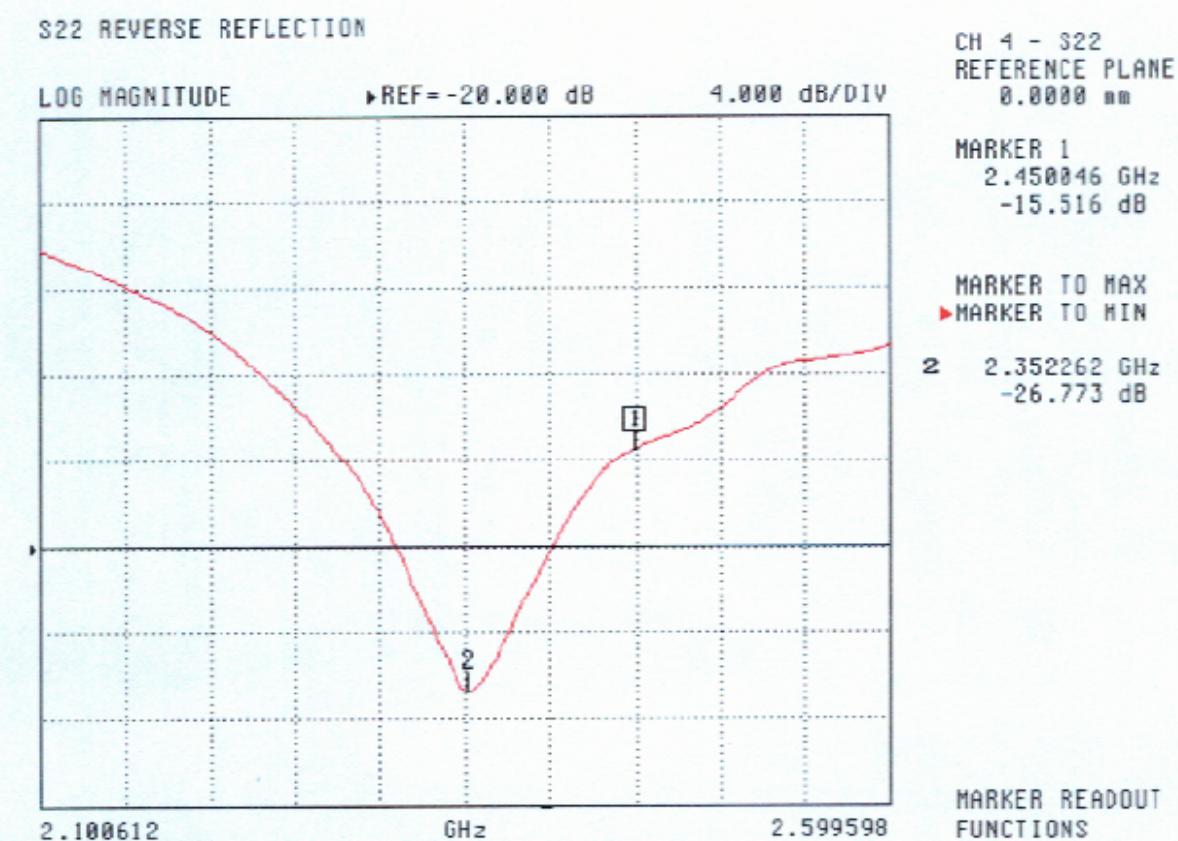
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Electrical Calibration

| Test | Result |
|-----------|----------------------------------|
| S11 R/L | -26.77 dB to -15.52 dB |
| SWR | 1.095 U to 1.397 U |
| Impedance | 47.81 Ω to 63.37 Ω |

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

S11 Parameter Return Loss

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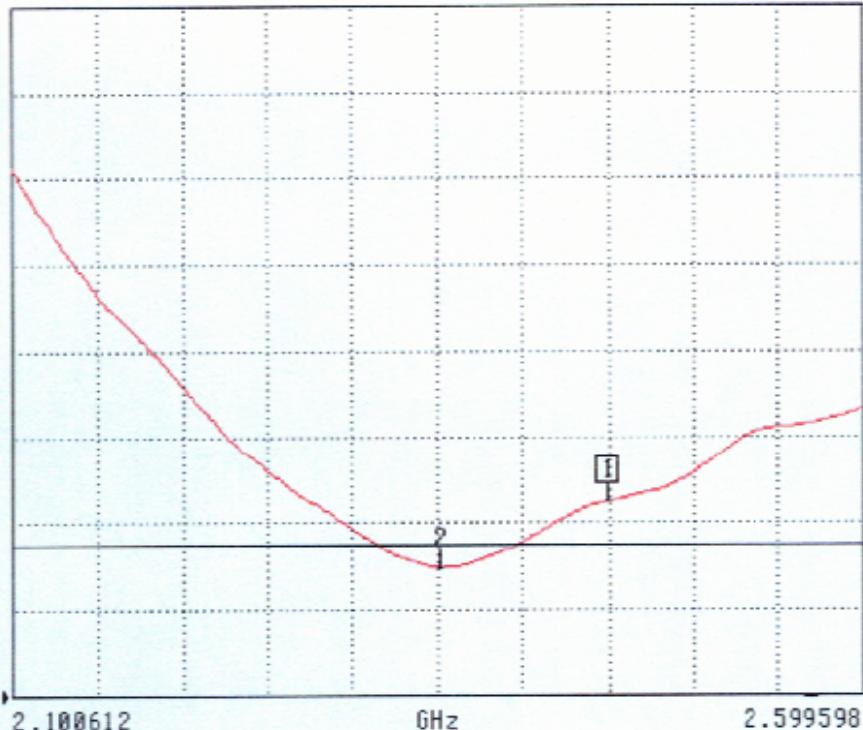
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SWR**S22 REVERSE REFLECTION**

SHR

REF = 500.000 mU

400.000 mU/DIV

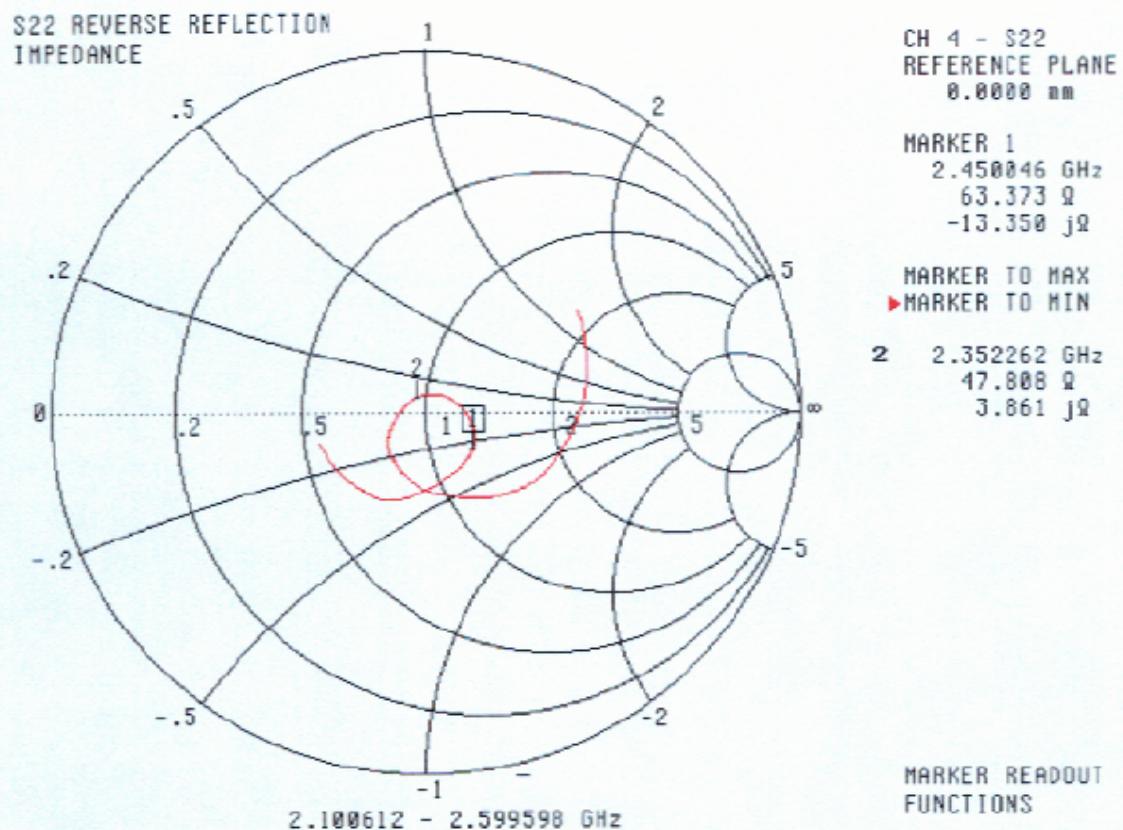
CH 4 - S22
REFERENCE PLANE
0.0000 mUMARKER 1
2.450046 GHz
1.397 UMARKER TO MAX
► MARKER TO MIN2 2.352262 GHz
1.095 UMARKER READOUT
FUNCTIONS

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Smith Chart Dipole Impedance

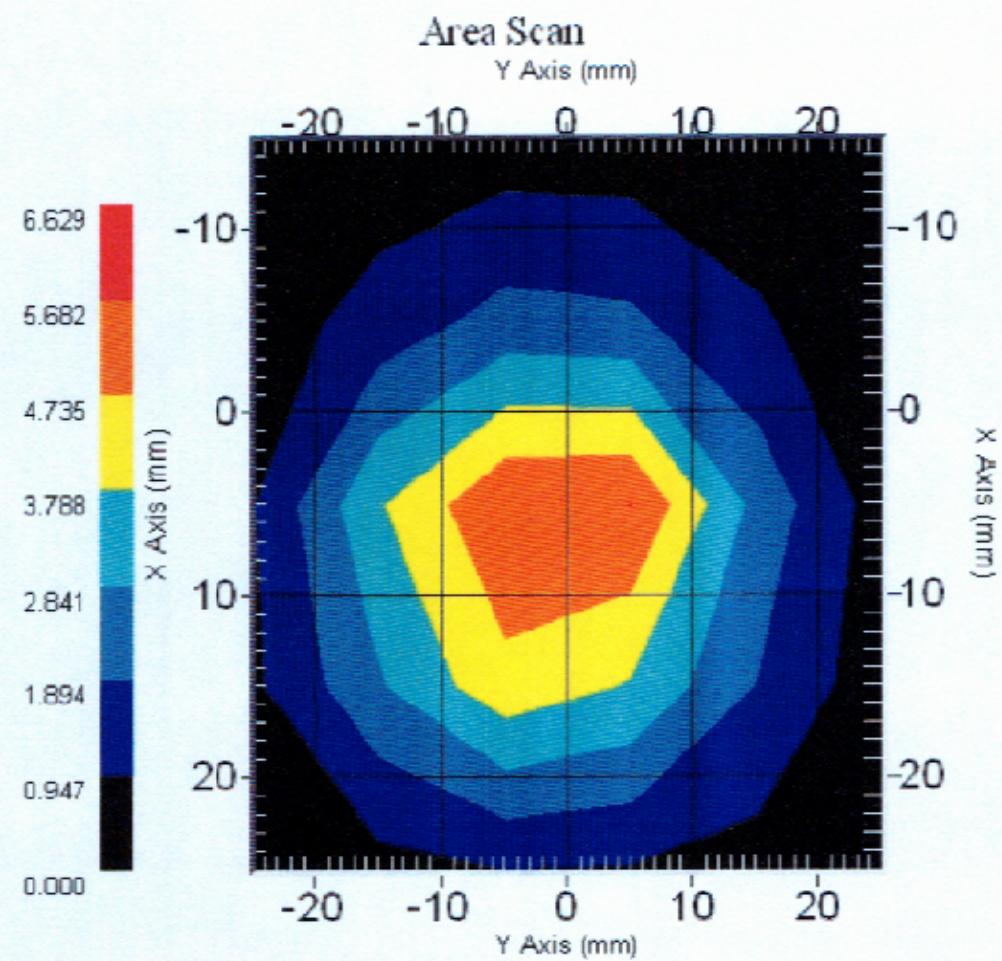
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System Validation Results Using the Electrically Calibrated Dipole

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



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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

APPENDIX D - TEST SYSTEM VERIFICATIONS SCANS**Liquid Measurement Result**

2006-09-06

| Stimulant | Freq [MHz] | Parameters | Liquid Temp [°C] | Target Value | Measured Value | Deviation [%] | Limits [%] |
|-----------|------------|--------------|------------------|--------------|----------------|---------------|------------|
| Body | 2450 | ϵ_r | 22 | 52.7 | 52.8 | 0.19 | ± 5 |
| | | σ | 22 | 1.95 | 1.96 | 0.51 | ± 5 |
| | | 1g SAR | 22 | 56.84 | 57.3 | 0.81 | ± 10 |
| Head | 2450 | ϵ_r | 22 | 39.2 | 38.9 | -0.76 | ± 5 |
| | | σ | 22 | 1.80 | 1.79 | -0.56 | ± 5 |
| | | 1g SAR | 22 | 52.4 | 51.9 | -0.95 | ± 10 |

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

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)**System Validation for Body****DUT: Dipole 2450 MHz; Type: D-2450-S-1; Serial: BCL-141**

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.96$ mho/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(4.27, 4.27, 4.27); Calibrated: 5/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 10/18/2005
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

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

Maximum value of SAR (interpolated) = 65.7 mW/g

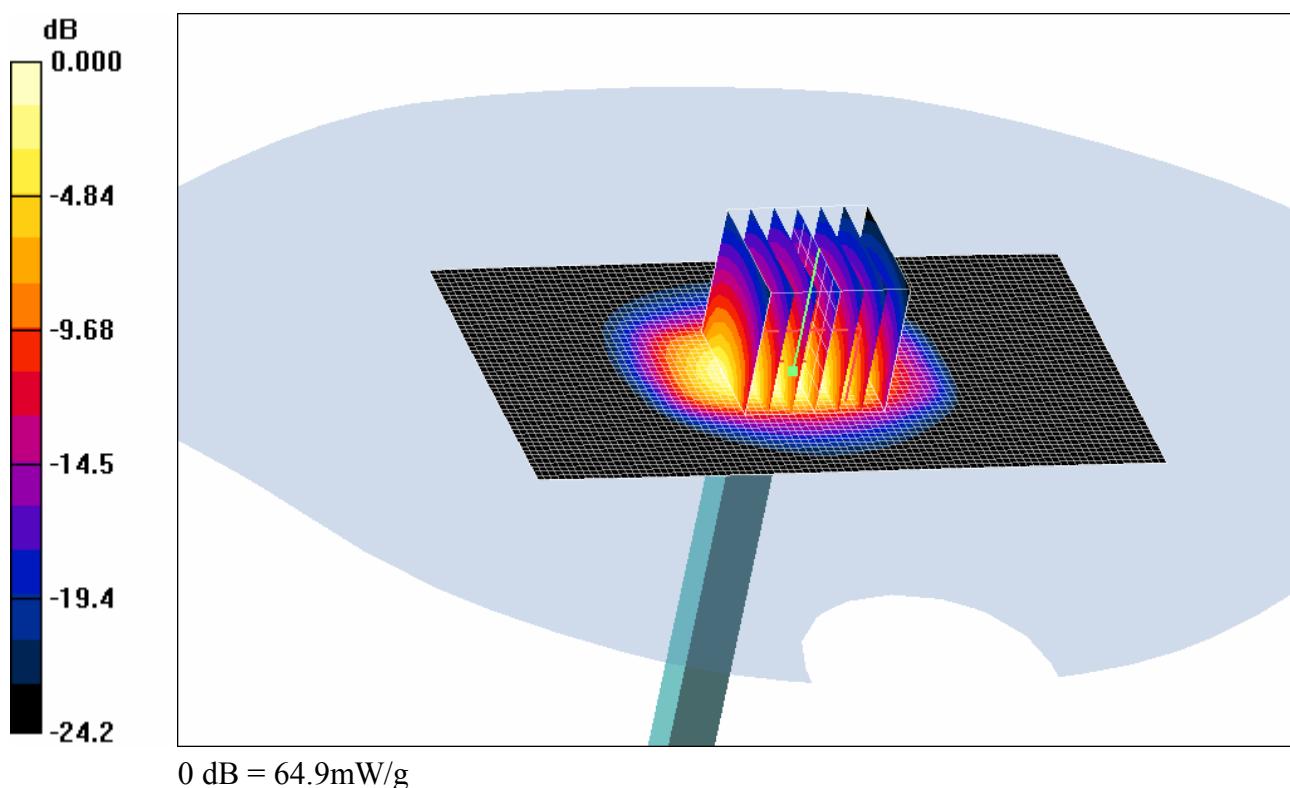
d=10mm, Pin=1W /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 186.5 V/m; Power Drift = 0.015 dB

Peak SAR (extrapolated) = 137.4 W/kg

SAR(1 g) = 57.3 mW/g; SAR(10 g) = 24.4 mW/g

Maximum value of SAR (measured) = 64.9 mW/g



Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**System Validation for Head****DUT: Dipole 2450 MHz; Type: D-2450-S-1; Serial: BCL-141**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.79$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(4.60, 4.60, 4.60); Calibrated: 5/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 10/18/2005
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

d=10mm, Pin=1W /Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 55.1 mW/g

d=10mm, Pin=1W /Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 198.4 V/m; Power Drift = 0.331 dB

Peak SAR (extrapolated) = 125.1 W/kg

SAR(1 g) = 51.9 mW/g; SAR(10 g) = 23.8 mW/g

Maximum value of SAR (measured) = 52.6 mW/g

