QuieTek

Appendix - Dipole Calibration

Validation Dipole 2450MHz
P/N: ALS-D-2450-S-2
S/N: QTK-319

NCL CALIBRATION LABORATORIES

Calibration File No: DC-409-1
Project Number: QTKB-Dipole Cal-5228

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.

Quietek Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-2450-S-2
Frequency: 2.45 GHz
Serial No: QTK-319

Customer: Quietek

Calibrated: 15 June 2006
Released on: 15 June 2006

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

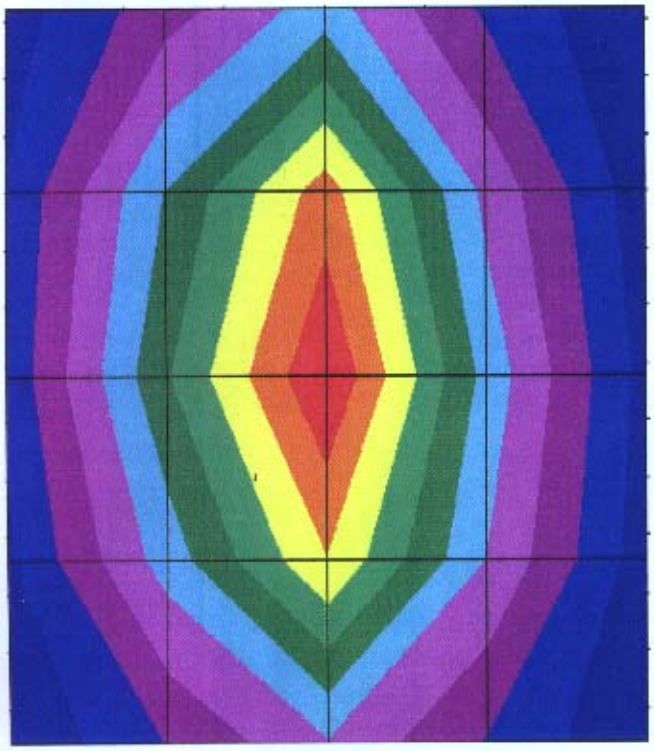
Length: 53.5 mm
Height: 30.4 mm

Electrical Specification

SWR: 1.21 U
Return Loss: -20.7 dB
Impedance: 47.7 Ω

System Validation Results

Frequency	1 Gram	10 Gram	Peak
2.45 GHz	48.07	25.65	95.6



Calibrated by

Approved by:

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 QTK-319. 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/APREL 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 QTK 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 QTK-319 was received for calibration.

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

Calibrated by 
Approved by: 

Dipole Calibration Results

Mechanical Verification

IEEE Length	IEEE Height	Measured Length	Measured Height
51.5 mm	30.4 mm	53.5 mm	30.4 mm

Tissue Validation

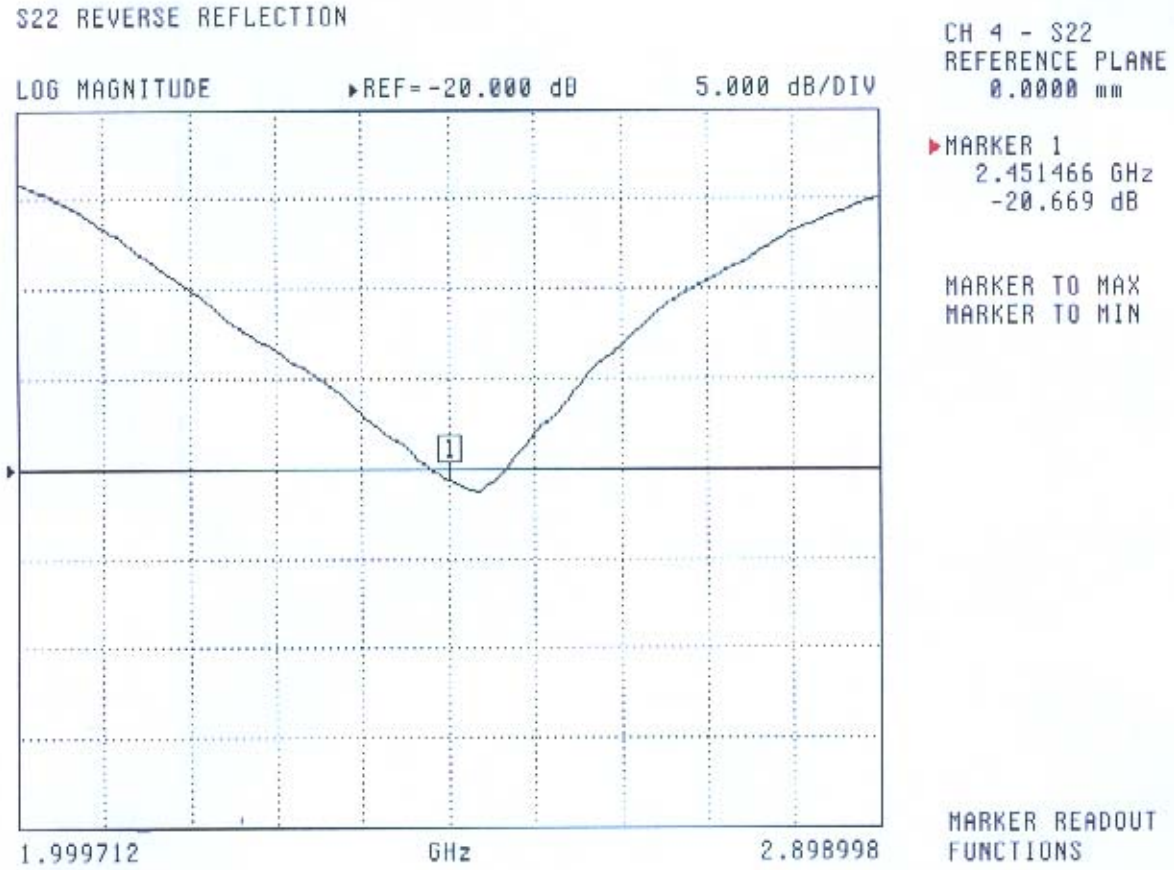
Body Tissue 2450 MHz	Measured
Dielectric constant, ε_r	52.5
Conductivity, σ [S/m]	1.78

Electrical Calibration

Test	Result
S11 R/L	-20.7 dB
SWR	1.21 U
Impedance	47.7 Ω

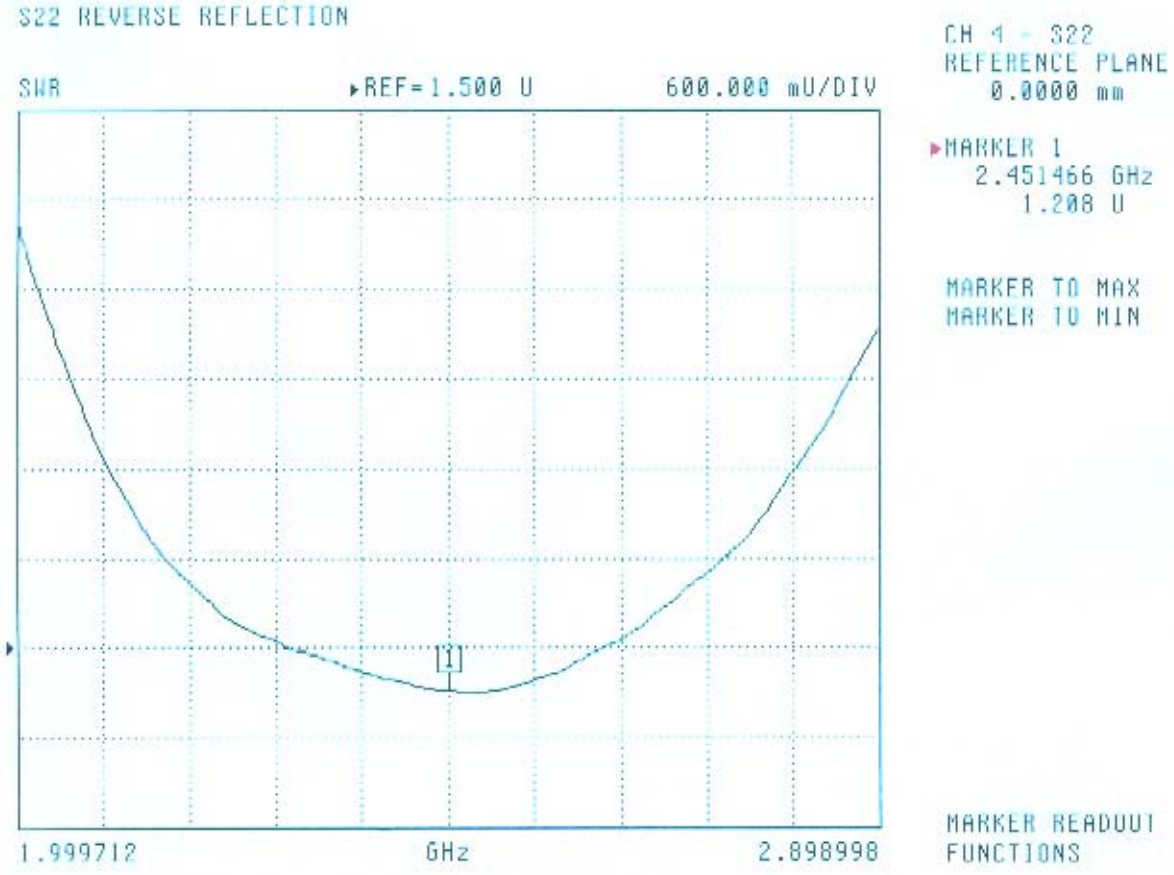
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss



Calibrated by
Approved by:

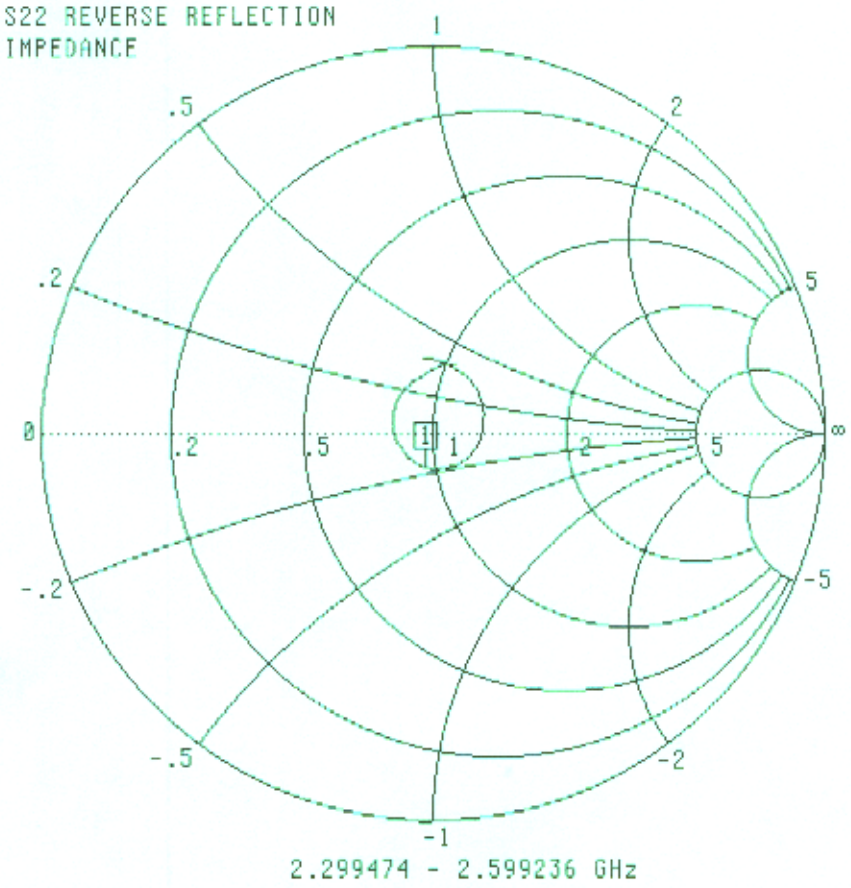
SWR



Calibrated by

Approved by:

Smith Chart Dipole Impedance



CH 4 - S22
REFERENCE PLANE
0.0000 mm

▸MARKER 1
2.451466 GHz
47.685 Ω
-8.809 jΩ

MARKER TO MAX
MARKER TO MIN

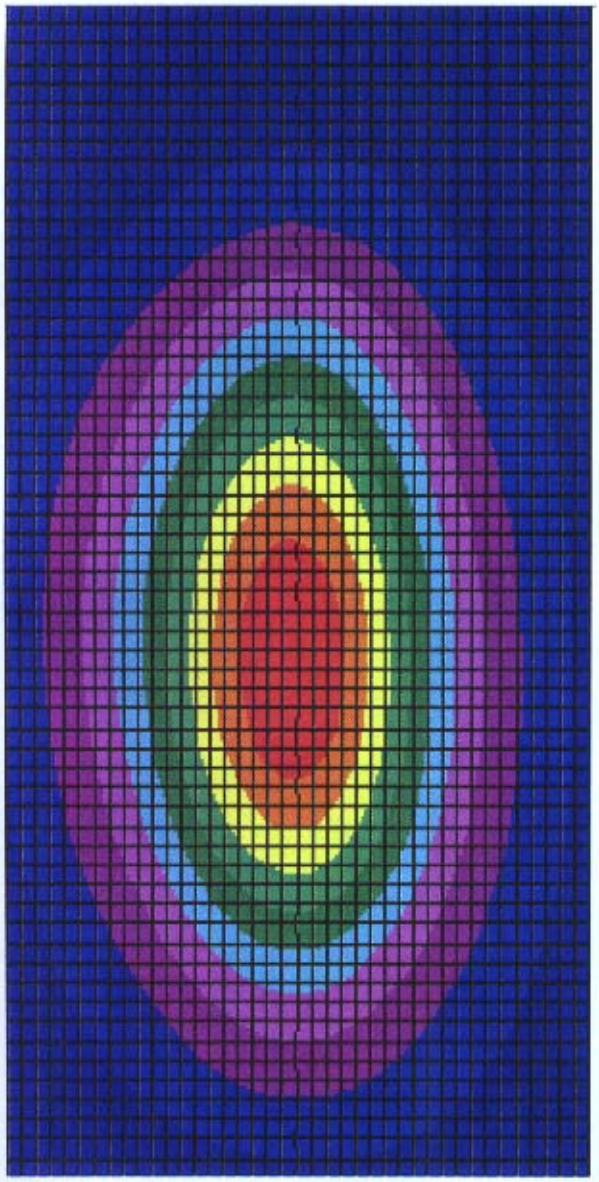
MARKER READOUT
FUNCTIONS

Calibrated by

Approved by:

System Validation Results Using the Electrically Calibrated Dipole

Frequency	1 Gram	10 Gram	Peak Above Feed Point
2.45 GHz	48.07	25.65	95.6



Calibrated by

Approved by:

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

QuieTek

Appendix - Dipole Calibration

Validation Dipole 5200MHz
P/N: ALS-D-5200-S-2
S/N: QTK-320

NCL CALIBRATION LABORATORIES

Calibration File No: DC-410-1
Project Number: QTKB-Dipole Cal-5229

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.

Quietek Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-5200-S-2
Frequency: 5.2 GHz
Serial No: QTK-320

Customer: Quietek

Calibrated: 15 June 2006
Released on: 15 June 2006

Released By: 

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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

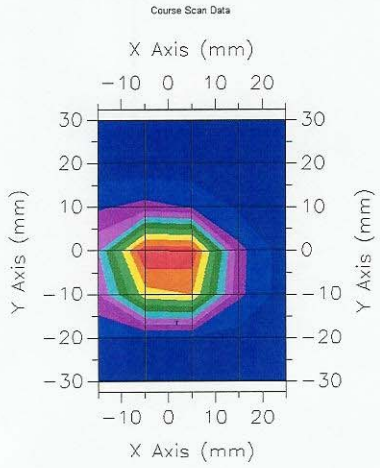
Length: 23.6 mm
Height: 14.0 mm

Electrical Specification

SWR: 1.57 U
Return Loss: -13.15 dB
Impedance: 78.2 Ω

System Validation Results

Frequency	1 Gram
5200 GHz	58.8



Calibrated by
Approved by:

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 QTK-320 at 5.2 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 ALSAS-10U, along with QTK E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

References

SSI-TP-018 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 QTK-320 was received for calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

 Calibrated by Approved by:

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
23.6 mm	14.0 mm	23.1 mm	14.2 mm

Tissue Validation

Head Tissue 5200 MHz	Measured
Dielectric constant, ε_r	39.94
Conductivity, σ [S/m]	5.24

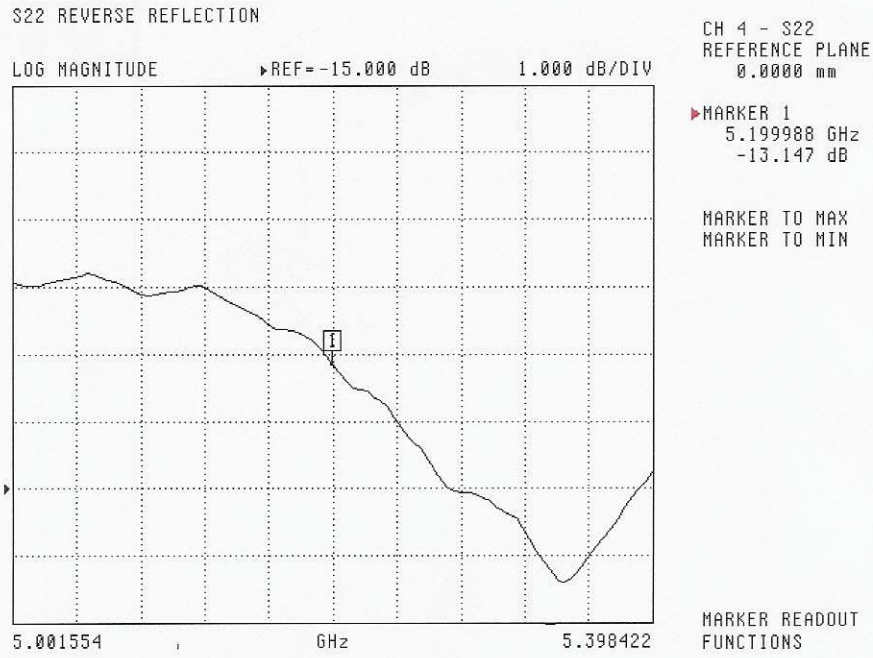
Calibrated by

Approved by:

Electrical Calibration

Test	Result
S11 R/L	-13.15 dB
SWR	1.57 U
Impedance	78.2 Ω

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



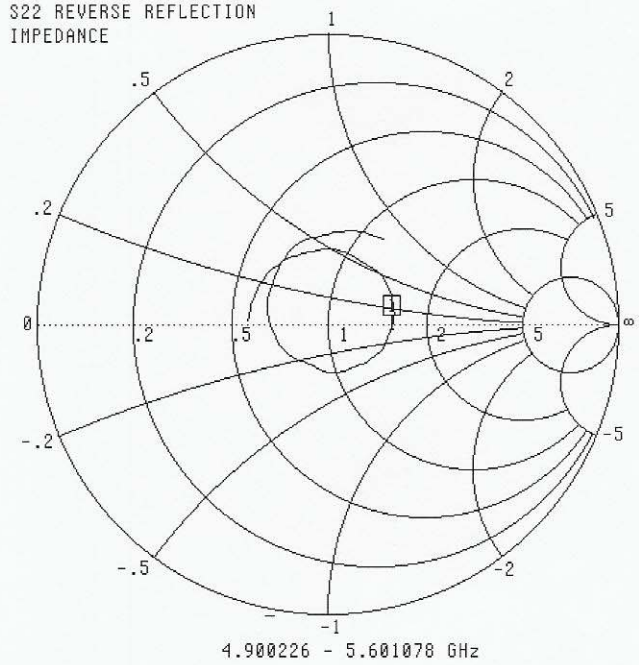
S11 Parameter Return Loss

Calibrated by
Approved by:

SWR

Calibrated by
Approved by:

Smith Chart Dipole Impedance

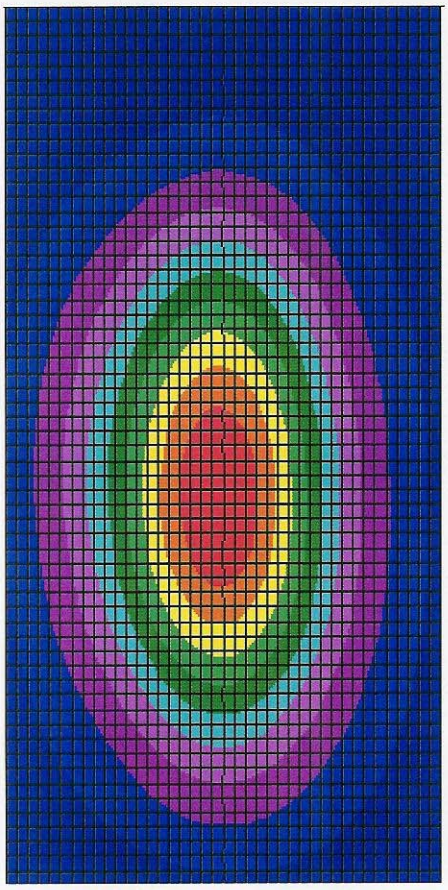


Calibrated by

Approved by:

System Validation Results Using a Complex Dipole Model (FDTD calculations)

Frequency	1 Gram
5.2 GHz	58.8



Test Equipment

Calibrated by

Approved by:

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 - Dipole Calibration

Validation Dipole 5800MHz
P/N: ALS-D-5800-S-2
S/N: QTK-321

NCL CALIBRATION LABORATORIES

Calibration File No: DC-411-1
Project Number: QTKB-Dipole Cal-5225

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.

Quietek Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-5800-S-2
Frequency: 5.8 GHz
Serial No: QTK-321

Customer: Quietek

Calibrated: 15 June 2006
Released on: 15 June 2006

Released By: 

NCL CALIBRATION LABORATORIES
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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

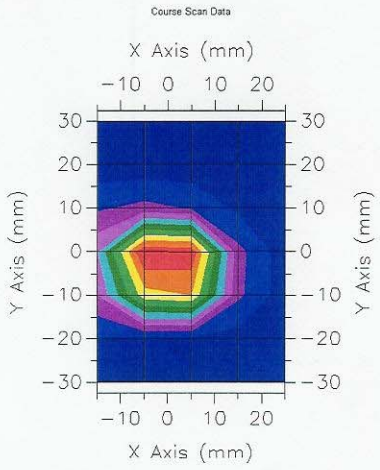
Length: 21.6 mm
Height: 12.6 mm

Electrical Specification

SWR: 1.78 U
Return Loss: -11.0 dB
Impedance: 74.8 Ω

System Validation Results

Frequency	1 Gram
5800 GHz	57.9



Calibrated by
Approved by:

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 QTK-321 at 5.8 GHz. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the IEEE mechanical specification. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with QTK E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

References

SSI-TP-018 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 QTK-321 was received for calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

 Calibrated by Approved by:

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
21.6 mm	12.6 mm	21.2 mm	13.1 mm

Tissue Validation

Head Tissue 5800 MHz	Measured
Dielectric constant, ε_r	35.15
Conductivity, σ [S/m]	6.4

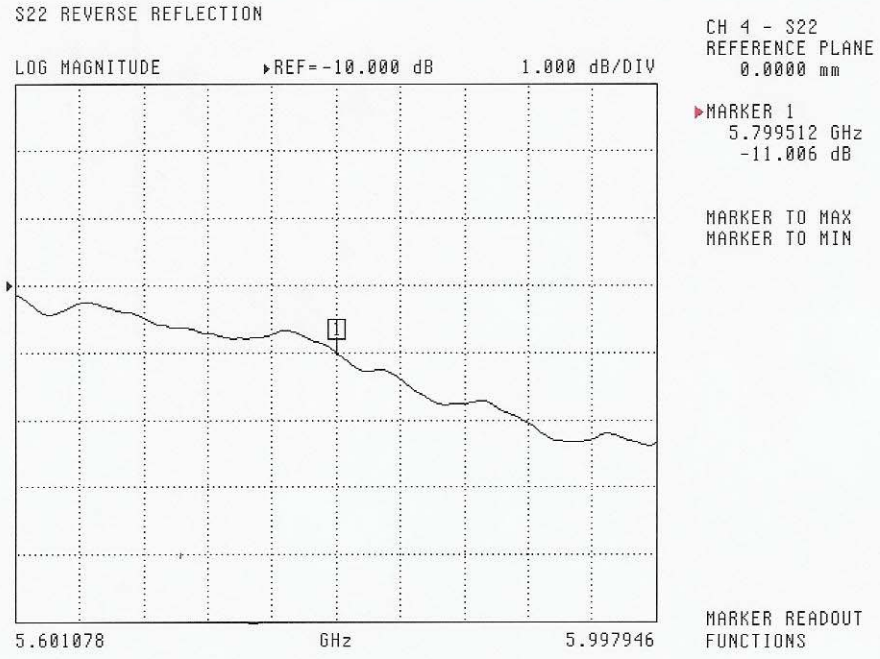
Calibrated by
Approved by:

Electrical Calibration

Test	Result
S11 R/L	-11.0 dB
SWR	1.78 U
Impedance	74.8 Ω

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

S11 Parameter Return Loss



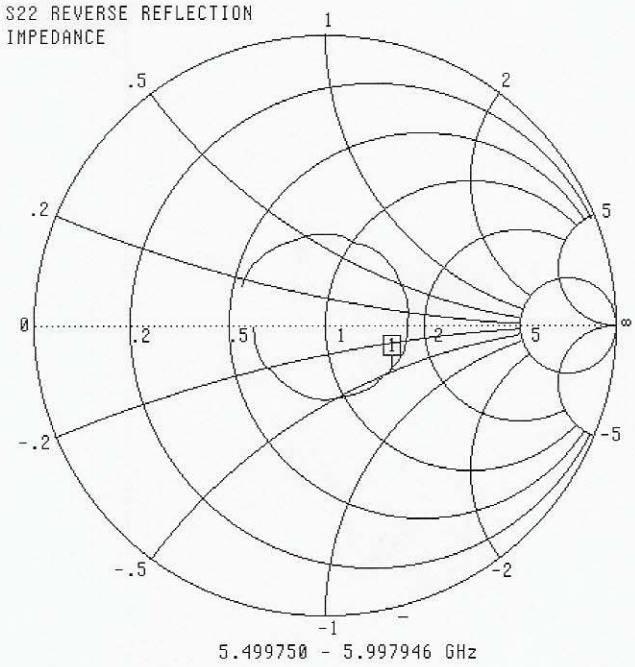
Calibrated by
Approved by:

SWR

Calibrated by

Approved by:

Smith Chart Dipole Impedance



CH 4 - S22
REFERENCE PLANE
0.0000 mm

▶MARKER 1
5.799512 GHz
74.849 Ω
-25.220 jΩ

MARKER TO MAX
MARKER TO MIN

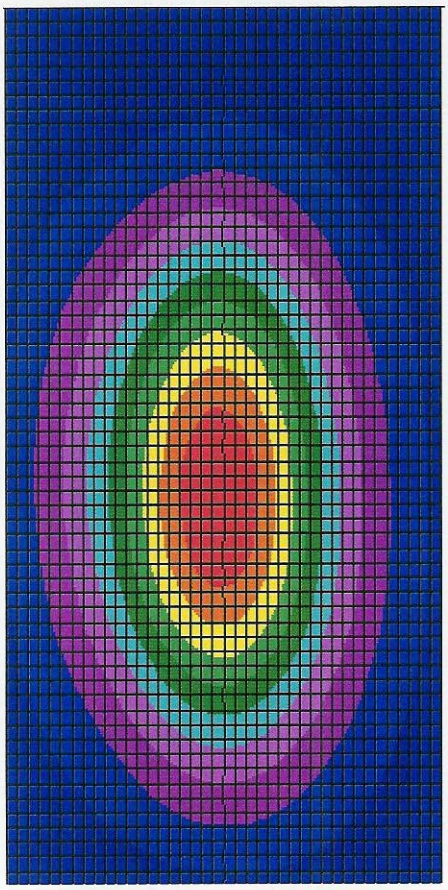
MARKER READOUT
FUNCTIONS

Calibrated by

Approved by:

System Validation Results Using a Complex Dipole Model (FDTD calculations)

Frequency	1 Gram
5.8 GHz	57.9



Calibrated by

Approved by:

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