Auden Techno Corp. RF Testing Lab

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SAR EVALUATION REPORT

Test Report No.：	**SAR - 00630**
Applicant：	**REMOTEK CORPORATION**
	(佳得股份有限公司)
Trade Name：	**REMOTEK**
Model Name：	**WP320**
EUT Type：	**Wireless LAN PC Card**
Dates of Test：	**Apr. 17、22, 2003**
Test Environment：	**Ambient Temperature： 22 ± 2 ℃**
	Relative Humidity： ＜ 60％
Test Specification：	**ANSI / IEEE Std. C95.1-1992**
	IEEE Std. P1528-200X

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of Auden. Auden does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
3. The measurement report has to be written approval of Auden. It may only be reproduced or published in full.

Eddie Chen **20030530**

Testing Center Manager

Auden Techno. Corp. RF Testing Lab

Contents

1. Description of Equipment Under Test (EUT)

APPLICANT： **REMOTEK CORPORATION**
台北縣汐止市新台五路一段 77 號 6F 之 6

EUT Type：	Wireless LAN PC Card
Trade Name：	REMOTEK
Model：	WP320
Test Device：	Prototype
Frequency Range：	2412MHz – 2472MHz (Ch.1–13)
FCC ID：	PY4-WP320
Operating Mode：	IEEE 802.11b DSSS (11Mbps)
RF Output Power：	Ch 1 18.23 dBm (Conducted)
	Ch 6 18.11 dBm (Conducted)
	Ch11 17.96 dBm (Conducted)
Max. SAR Measurement：	0.663 W/kg
Antenna Type：	Integral PCB antenna
Device Category：	Portable
RF Exposure Environment：	General Population / Uncontrolled
Device Serial No.：	9204-000A5000D000
Auxiliary Equipment：	Notebook computer COMPAQ
	(S/N：N160 C933X310DC12T8L TAI)

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment / general population exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in IEEE Std. P1528-200X.

Figure 1. EUT Photo

2. Introduction

The Auden Techno. Corp. RF Testing Laboratory has performed measurements of the maximum potential exposure to the user of PCMCIA card **REMOTEK WP320**. The test procedures, as described in American National Standards, Institute C95.1 – 1992〔1〕, FCC OET Bulletin65-1997 were employed and they specify the maximum exposure limit of 1.6mW/g as averaged over any 1 gram of tissue for portable devices being used within 20cm of the used in the uncontrolled environment. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the equipment used are included within this test report.

3. SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dw) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Figure 2).

$$\text{SAR} = \frac{d}{dt}\left(\frac{dw}{dm}\right) = \frac{d}{dt}\left(\frac{dw}{\rho dv}\right)$$

Figure 2. SAR Mathematical Equation

SAR is expressed in units of Watts per kilogram (W/kg)

$$\text{SAR} = \frac{\sigma E^2}{\rho}$$

Where：

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m^3)

E = RMS electric field strength (V/m)

＊NOTE：

The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane〔2〕

4. SAR Measurement Setup

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ±0.025mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length = 300mm) to the data acquisition unit.

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Measurement Server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chipdisk and 64MB RAM. The necessary circuits for communication with either the DAE3 electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board. The PC consists of the INTEL P4 2.4GHz computer with Windows2000 system and SAR Measurement Software DASY4, Post Processor SEMCAD, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection…etc. is connected to the Electro-optical converter (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the Measurement Server.

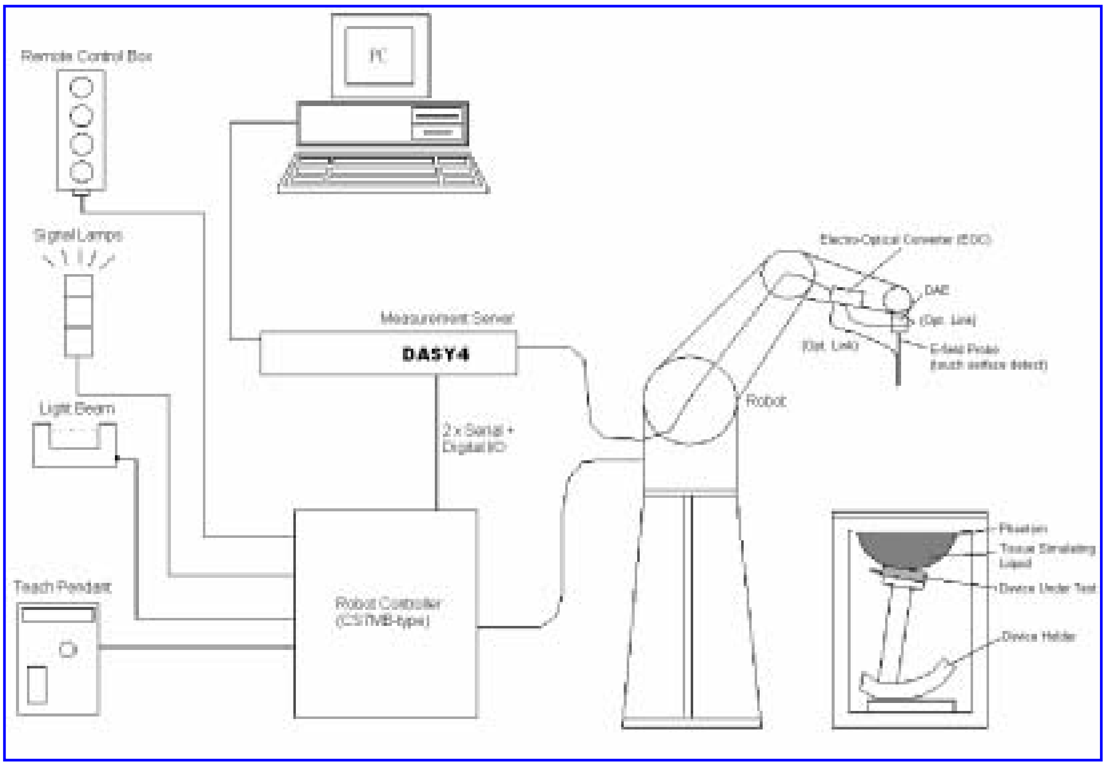


Figure 3. SAR Lab Test Measurement Setup

The DAE3 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in〔3〕.

5. System Components

5.1 DASY4 E-Field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6 SN：1530 & SN：1531 (manufactured by SPEAG), designed in the classical triangular configuration〔3〕and optimized for dosimetric evaluation. The probes is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.

5.1.1 ET3DV6 E-Field Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.q., glycol)
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at frequencies of 450MHz, 900MHz, 1.8GHz and 2.45GHz (accuracy ±8%) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic Range	5 µW/g to > 100mW/g; Linearity: ±0.2dB
Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surface(ET3DV6 only)
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diameter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 3GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

Figure 4.
ET3DV6 E-field Probe

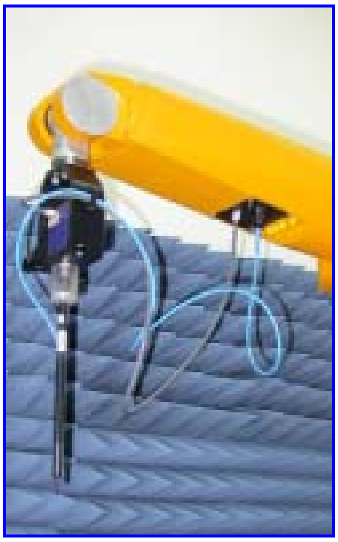


Figure 5.
Probe setup on robot

5.1.2 ET3DV6 E-Field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure described in〔4〕with accuracy better than ± 10%. The spherical isotropy was evaluated with the procedure described in〔5〕and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1GHz, and in a wave guide above 1GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where：

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

$$SAR = \frac{|E|^2 \sigma}{\rho}$$

Where：

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

5.2 Data Acquisition Electronic (DAE) System

Cell Controller

Processor： Intel Pentium 4

Clock Speed： 2.4GHz

Operating System： Windows 2000 Professional

Data Converter

Features： Signal Amplifier, multiplexer, A/D converter, and control logic

Software： DASY4 V4.1 (Build 33) & SEMCAD V1.6 (Build 109)

Connecting Lines： Optical downlink for data and status info.
Optical uplink for commands and clock

5.3 Robot

Positioner： Stäubli Unimation Corp. Robot Model: RX90L

Repeatability： ±0.025 mm

No. of Axis： 6

5.4 Measurement Server

Processor： PC/104 with a 166MHz low-power Pentium

I/O-board： Link to DAE3

16-bit A/D converter for surface detection system

Digital I/O interface

Serial link to robot

Direct emergency stop output for robot

5.5 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeat ably positioned according to the IEEE SCC34-SC2 and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).

＊**Note**：A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations〔6〕. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Larger DUT cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values. Therefore those devices are normally only tested at the flat part of the SAM.

Figure 6. Device Holder

5.6 Phantom - SAM V4.0

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

Figure 7. SAM Twin Phantom

Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	810×1000×500 mm (H×L×W)

Table 1. Specification of SAM V4.0

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY4 software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension .DA4. The postprocessing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

To avoid unintentional parameter changes or data manipulations, the parameters in measured files are locked. In the administrator access mode of the software, the parameters can be unlocked (see Section 6.9 Unlocking a Setup). After changing the parameters, the measured scans can be reevaluated in the postprocessing engine.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m] or [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

5.7.2 Data Evaluation

The DASY4 postprocessing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software：

Probe parameters：	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	dcpi
Device parameters：	- Frequency	f
	- Crest factor	cf
Media parameters：	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as：

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated：

E-field probes：

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes：

$$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

with V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)

µ V/(V/m)^2 for E-field Probes

$ConvF$ = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude)：

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm^3

＊**Note**： that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = \frac{H_{tot}^2}{37.7}$$

with P_{pwe} = equivalent power density of a plane wave in mW/cm^2

E_{tot} = total electric field strength in V/m

H_{tot} = total magnetic field strength in A/m

6. Test Equipment List

Manufacturer	Name of Equipment	Type / Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Filed Probe	ET3DV6	1530	May 3, 2002	May 3, 2003
SPEAG	Dosimetric E-Filed Probe	ET3DV6	1531	Aug. 27, 2002	Aug. 27, 2003
SPEAG	900MHz System Validation Kit	D900V2	172	Dec. 17, 2002	Dec. 17, 2003
SPEAG	1800MHz System Validation Kit	D1800V2	265	May 15, 2002	May 15, 2003
SPEAG	2450MHz System Validation Kit	D2450V2	712	Jul. 15, 2002	Jul 15, 2004
SPEAG	Data Acquisition Electronics	DAE3	393	Dec. 18, 2002	Dec. 18, 2003
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	Phantom	SAM V4.0	1009	NCR	NCR
SPEAG	Robot	Staubli RX90L	F00/589B1/A/01	NCR	NCR
SPEAG	Software	DASY4 V4.1 Build 33	N/A	NCR	NCR
SPEAG	Software	SEMCAD V1.6 Build 109	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 001 BA	1021	NCR	NCR
Agilent	Wireless Communication Test Set	8960(E5515C)	GB41450409	Feb. 18, 2002	Feb. 18, 2004
Agilent	S-Parameter Network Analyzer	8720ES	US39172472	May 14, 2002	May 14, 2003
Agilent	Dielectric Probe Kit	85070C	US99360094	NCR	NCR
Agilent	Power Meter	E4418B	GB40206143	May 10, 2002	May 10, 2003
Agilent	Power Sensor	8481H	3318A0779	Jun. 28, 2002	Jun. 28, 2003
Agilent	Signal Generator	8648C	3847A05201	Jun. 28, 2001	Jun. 28, 2003
Agilent	Dual Directional Coupler	778D	50334	NCR	NCR
Mini-Circuits	Power Amplifier	ZHL-42W-SMA	D111103#5	NCR	NCR
Rhode & Schwarz	Universal Radio Communication Tester	CMU200	838207/024	Mar. 18, 2003	Mar. 19, 2004

Table 2. Test Equipment List

7. Tissue Simulating Liquids

The Head and Muscle mixtures consist of a viscous gel using hydroxethylcellullouse (HEC) gelling agent and saline solution. Preservation with a bacteriacide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.
The dielectric parameters of the liquids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an 8720ES Network Analyzer.

INGREDIENT	FREQUENCY	
	HSL2450 (Head)	MSL2450 (Body)
Water	45%	69.8%
Glycol monobutyl	55%	30.2%

Table 3. Recipes for Head & Muscle Tissue Simulating Liquids

IEEE SCC-34/SC-2 in P1528 recommended Tissue Dielectric Parameters

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equation and extrapolated according to the head parameter specified in P1528.

Target Frequency	Head		Body	
(MHz)	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

Table 4. Tissue dielectric parameters for head and body phantoms

7.1 Liquid Confirmation

7.1.1 Parameters

Liquid Verify							
Ambient Temperature： 22±2 ℃；Relative Humidity： < 60 %							
Liquid Tyep	**Temp(℃)**	**Parameters**	**Target Value**	**Measured Value**	**Deviation(%)**	**Limit(%)**	**Measured Date**
2450 MHz Body	21.3	εr	**52.7**	51.6157	-2.1	**± 5**	Apr. 17, 2003
		σ	**1.95**	1.98783	1.9		
2450 MHz Body	23.0	εr	**52.7**	51.2643	-2.7	**± 5**	Apr. 22, 2003
		σ	**1.95**	2.02976	4.1		

Table 5. Measured Tissue dielectric parameters for head and body phantoms

7.1.2 Liquid Depth

Figure 8. Measured liquid depth

8. Measurement Process

8.1 Device and Test Conditions

The Test Device was provided by **REMOTEK CORPORATION** for this evaluation. The device was put in operation using the Test program which be installed in the Notebook to transmit a continuous signal. The antenna(s), battery and accessories shall be those specified by the manufacturer. The battery shall be fully charged before each measurement and there shall be no external connections.

The output power and frequency (channel) shall be controlled using an internal test program The Device shall be set to transmit at its highest output power level.

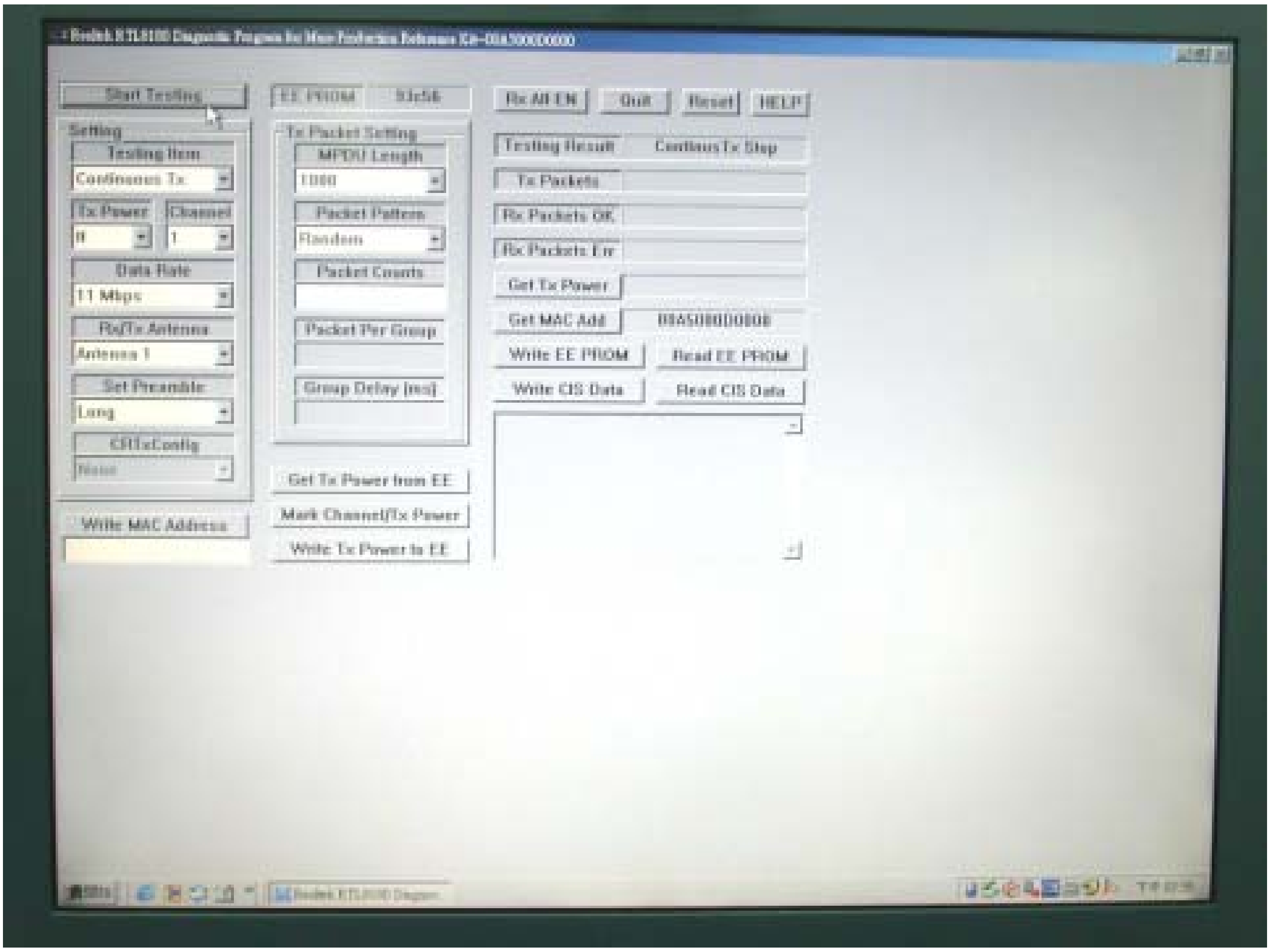


Figure 9. Test Program

8.2 System Performance Check

8.2.1 Symmetric Dipoles for System Validation

Figure 10. Validation Kit

Construction Symmetrical dipole with l/4 balun
Enables measurement of feedpoint impedance with NWA
Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor
Calibration Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions

Frequency 900, 1800, 2450MHz

Return Loss > 20 dB at specified validation position

Power Capability > 100 W (f < 1GHz); > 40 W (f > 1GHz)

Options Dipoles for other frequencies or solutions and other calibration conditions are available upon request

Dimensions D900V2: dipole length: 149 mm; overall height: 330 mm
D1800V2: dipole length: 72 mm; overall height: 300 mm
D2450V2: dipole length: 51.5 mm; overall height: 300 mm

8.2.2 Validation

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ± 7%. The validation was performed at 2450MHz.

Validation kit	Mixture Type	SAR_{peak} [mW/g]	SAR_{1g} [mW/g]	SAR_{10g} [mW/g]	Date of Calibration
D2450V2-SN712	Body	**98.8**	**52.0**	25.0	Jul. 15, 2002

Frequency (MHz)	Power (mW)	SAR_{peak} (mW/g)	SAR_{1g} (mW/g)	Drift (dB)	Difference percentage		Date
					Peak	1g	
2450 (Body)	250	12.6	5.86	-0.08	-3.1 %	-6.2 %	Apr. 17, 2003
	Normalize to 1 Watt	50.4	23.44				
2450 (Body)	250	13.8	6.39	0.004	6.2 %	2.2 %	Apr. 22, 2003
	Normalize to 1 Watt	55.2	25.56				

8.3 Dosimetric Assessment Setup

8.3.1 Test Position

The following test configurations have been applied in this test report:

Bottom： EUT in the bottom PCMCIA slot of the notebook, the bottom of the notebook contact the bottom of the flat phantom with 0 cm separation distance.

Left Side： EUT in the bottom PCMCIA slot of the notebook, the keyboard face of the notebook is perpendicular to the bottom of the flat phantom and the EUT is located between notebook and phantom. The separation distance is 0 cm between the tip of the EUT and the bottom of the flat phantom.

Top： EUT in the bottom PCMCIA slot of the notebook, the top of the notebook contact the bottom of the flat phantom with 0 cm separation distance.

8.3.2 Measurement Procedures

The evaluation was performed with the following procedures：

Surface Check： A surface check job gathers data used with optical surface detection. It determines the distance from the phantom surface where the reflection from the optical detector has its peak. Any following measurement jobs using optical surface detection will then rely on this value. The surface check performs its search a specified number of times, so that the repeatability can be verified.

Reference： The reference job measures the field at a specified reference position, at 4 mm from the selected section's grid reference point.

Area Scan： The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines can find the maximum locations even in relatively coarse grids.

When an area scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. Any following zoom scan within the same procedure will then perform fine scans around these maxima.

The area covered the entire dimension of the EUT and the horizontal grid spacing was 15 mm × 15 mm.

Zoom Scan： Zoom scans are used to assess the highest averaged SAR for cubic averaging volumes with 1 g and 10 g of simulated tissue. The zoom scan measures 5 x 5 x 7 points in a 32 x 32 x 30 mm cube whose base faces are centered around the maxima returned from a preceding area scan within the same procedure.

Drift： The drift job measures the field at the same location as the most recent reference job within the same procedure, with the same settings. The drift measurement gives the field difference in dB from the last reference measurement. Several drift measurements are possible for each reference measurement. This allows monitoring of the power drift of the device in the batch process.

If the value changed by more than 5%, the evaluation was repeated.

8.4 Spatial Peak SAR Evaluation

The DASY4 software includes all numerical procedures necessary to evaluate the spatial peak SAR values. Based on the Draft: SCC-34, SC-2, WG-2 - Computational Dosimetry, IEEE P1529/D0.0 (Draft Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) Associated with the Use of Wireless Handsets - Computational Techniques), a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

The base for the evaluation is a "cube" measurement in a volume of (32x32x30)mm^3 (5x5x7 points). The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan. If the 10g cube or both cubes are not entirely inside the measured volumes, the system issues a warning regarding the evaluated spatial peak values within the Postprocessing engine (SEMCAD). This means that if the measured volume is shifted, higher values might be possible. To get the correct values you can use a finer measurement grid for the area scan. In complicated field distributions, a large grid spacing for the area scan might miss some details and give an incorrectly interpolated peak location.

The entire evaluation of the spatial peak values is performed within the Postprocessing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into three stages:

Interpolation and Extrapolation

The probe is calibrated at the center of the dipole sensors which is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated.

In DASY4, the choice of the coordinate system defining the location of the measurement points has no influence on the uncertainty of the interpolation, Maxima Search and SAR extrapolation routines. The interpolation, Maxima Search and extrapolation routines are all based on the modified Quadratic Shepard's method [7].

9. Measurement Uncertainty

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental. However, we estimate the measurement uncertainties in SAR to be less than ± 27 %〔8〕.

According to ANSI/IEEE C95.3〔9〕, the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of ±1 to 3 dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least ±2dB can be expected.

According to CENELEC〔10〕, typical worst-case uncertainty of field measurements is ±5 dB. For well-defined modulation characteristics the uncertainty can be reduced to ±3 dB.

Source of Uncertainty	Uncertainty Value	Probability Distribution	Divisor	c_i	Standard Uncertainty ±1% (1-g)	v_i or V_{eff}
Type-A	0.9 %	Normal	1	1	0.9	9
Measurement System						
Probe Calibration	7 %	Normal	2	1	3.5	∞
Axial Isotropy	0.2dB	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
Hemispherical Isotropy	9.6 %	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
Spatial Resolution	0 %	Rectangular	$\sqrt{3}$	1	0	∞
Boundary Effect	11.0 %	Rectangular	$\sqrt{3}$	1	6.4	∞
Linearity	0.2dB	Rectangular	$\sqrt{3}$	1	2.7	∞
Detection Limit	1.0 %	Rectangular	$\sqrt{3}$	1	0.6	∞
Readout Electronics	1.0 %	Normal	1	1	1.0	∞
RF Ambient Conditions	3.0 %	Rectangular	$\sqrt{3}$	1	1.73	∞
Probe Positioner Mech. Const.	0.4 %	Rectangular	$\sqrt{3}$	1	0.2	∞
Probe Positioning	0.35 %	Rectangular	$\sqrt{3}$	1	0.2	∞
Extrapolation and Integration	3.9 %	Rectangular	$\sqrt{3}$	1	2.3	∞
Test sample Related						
Test sample Positioning		Normal	1	1	4.7	5
Device Holder Uncertainty		Normal	1	1	6.1	5
Drift of Output Power		Rectangular	$\sqrt{3}$	1	2.9	∞
Phantom and Setup						
Phantom Uncertainty (Including temperature effects)	4.0%	Rectangular	$\sqrt{3}$	1	2.3	∞
Liquid Conductivity (target)	5.0%	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Liquid Conductivity (meas.)	10.0%	Rectangular	$\sqrt{3}$	0.6	3.4	∞
Liquid Permittivity (target)	5.0%	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Liquid Permittivity (meas.)	5.0%	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Combined standard uncertainty		RSS			13.5	88.7
Expanded uncertainty (Coverage factor = 2)		Normal (k=2)			27	

Table 6. Uncertainty Budget of DASY

10. SAR Test Results Summary

10.1 SAR Test Results

Liquid :

		Measured date :	Apr. 17、 22, 2003
Mixture Type :	MSL2450	Liquid Temperature (℃) :	21.3
Dielectric Constant :	51.2427	Depth of liquid (cm) :	15
Conductivity :	2.0469		

Ambient :

Ambient TEMPERATURE (℃) :	22 ± 2	Relative HUMIDITY (%) :	< 60

Measurement :

Crest Factor :	1	Probe S/N :	1531

Frequency		Band	Power (dBm)	Device Position	Antenna Position	SAR_{1g} [mW/g]	Power Drift	Remark
MHz	Ch.							
2412	1	802.11b	18.23	Bottom	Embedded	0.609	0.06	-
2437	6	802.11b	18.11	Bottom	Embedded	0.564	-0.02	-
2462	11	802.11b	17.96	Bottom	Embedded	0.663	-0.3	-
ANSI / IEEE C95.1 1992 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					Brain 1.6 W/kg (mW/g) Averaged over 1 gram			

Table 7. SAR Test Results for Bottom Position

Figure 11. Bottom (Notebook PC touching SAM phantom)
Distance of the PCMCIA card to the phantom = 1.0 cm

Frequency		Band	Power (dBm)	Device Position	Antenna Position	SAR_{1g} [mW/g]	Power Drift	Remark
MHz	Ch.							
2412	1	802.11b	18.23	Left Side	Embedded	0.185	0.01	-
2437	6	802.11b	18.11	Left Side	Embedded	0.149	-0.02	-
2462	11	802.11b	17.96	Left Side	Embedded	0.139	-0.09	-
ANSI / IEEE C95.1 1992 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					Brain 1.6 W/kg (mW/g) Averaged over 1 gram			

Table 8. SAR Test Results for Left Side Position

Figure 12. Left side (PCMCIA card touching SAM Phantom)
Distance of the PCMCIA card to the phantom = 0 cm

Frequency		Band	Power (dBm)	Device Position	Antenna Position	SAR_{1g} [mW/g]	Power Drift	Remark
MHz	Ch.							
2412	1	802.11b	18.23	Top	Embedded	0.561	-0.2	-
2437	6	802.11b	18.11	Top	Embedded	0.535	-0.09	-
2462	11	802.11b	17.96	Top	Embedded	0.571	0.2	-
ANSI / IEEE C95.1 1992 - Safety Limit Spatial Peak Uncontrolled Exposure/General Population					Brain 1.6 W/kg (mW/g) Averaged over 1 gram			

Table 9. SAR Test Results for Top Position

Figure 13.Top (Notebook PC touching SAM Phantom)
Distance of the PCMCIA card to the phantom = 1.0 cm
※The laptop computer was opened in this position.

10.2 ANSI/IEEE C95.1 – 1992 RF Exposure Limit

Human Exposure	Population Uncontrolled Exposure (W/kg) or (mW/g)	Occupational Controlled Exposure (W/kg) or (mW/g)
Spatial Peak SAR* (Brain)	1.60	8.00
Spatial Peak SAR** (Whole Body)	0.08	0.40
Spatial Peak SAR*** (Hands / Feet / Ankle / Wrist)	4.00	20.00

Table 10. Safety Limits for Partial Body Exposure

Notes：

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole – body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Population / Uncontrolled Environments： are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Occupational / Controlled Environments： are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

11.Conclusion

The SAR test values found for the PCMCIA card **REMOTEK CORPORATION Trade Name：REMOTEK Model(s)：WP320**, are below the maximum recommended level of 1.6 W/kg (mW/g).

12.References

[1] ANSI/IEEE C95.1-1991, "*American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300KHz to 100GHz",* New York: IEEE, Aug. 1992.

[2] NCRP, National Council on Radiation Protection and Measurements, "*Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields"*, NCRP report NO. 86, 1986.

[3] T. Schmid, O. Egger, and N. Kuster, "*Automatic E-field scanning system for dosimetric assessments*", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp, 105-113, Jan. 1996.

[4] K. Poković, T. Schmid, and N. Kuster, "*Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequency*", in ICECOM'97, Dubrovnik, October 15-17, 1997, pp.120-124.

[5] K. Poković, T. Schmid, and N. 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.

[6] N. Kuster, and Q. Balzano, "*Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz"*, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[7] Robert J. Renka, "*Multivariate Interpolation Of Large Sets Of Scattered Data*", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988 , pp. 139-148.

[8] N. Kuster, R. Kastle, T. Schmid, *Dosimetric evaluation of mobile communications equipment with known precision*, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[9] ANSI/IEEE C95.3-1991, "*IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave,* New York: IEEE, Aug. 1992.

[10] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), *Human Exposure to Electromagnetic Fields High-frequency*: 10KHz-300GHz, Jan. 1995.

Appendix A – System Performance Check

Date/Time: 04/17/03 10:41:01

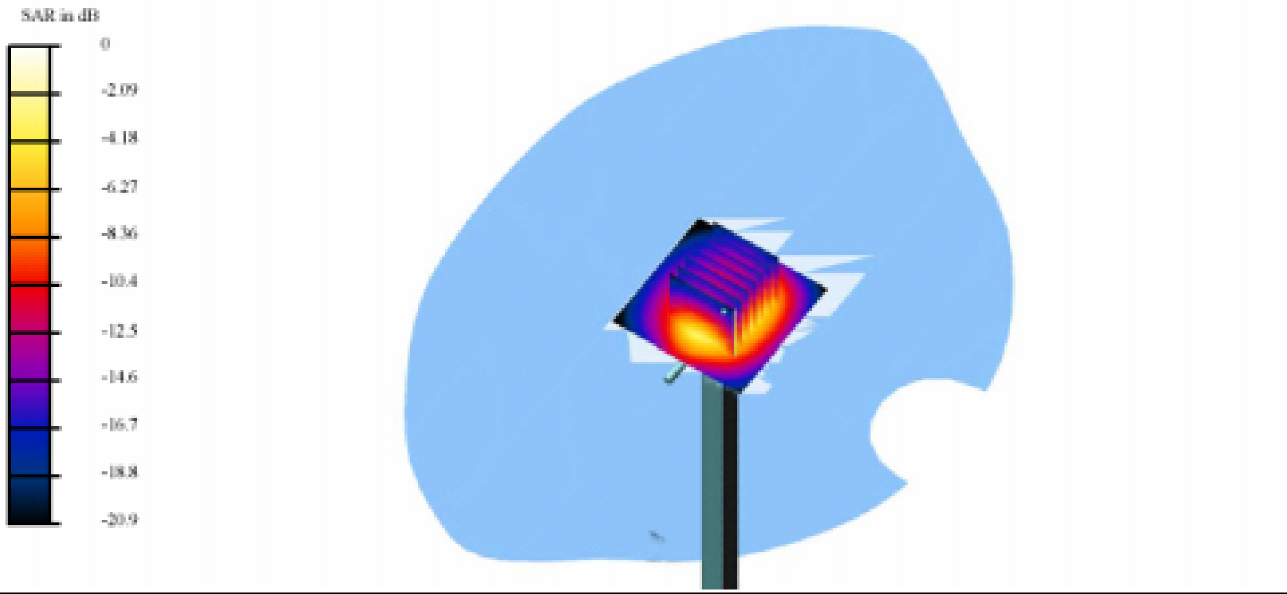
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: System Performance Check Muscle 2450MHz.da4

DUT: Dipole 2450 MHz Type & Serial Number: D2450V2 - SN:712
Program: SAR-00630; System Performance Check

Communication System: CW 2450MHz; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 1.98783 mho/m, ε_r = 51.6157, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 86.3 V/m
Peak SAR = 25.4 mW/g
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.86 mW/g
Power Drift = -0.08 dB



2003/04/17

Date/Time: 04/22/03 19:06:43

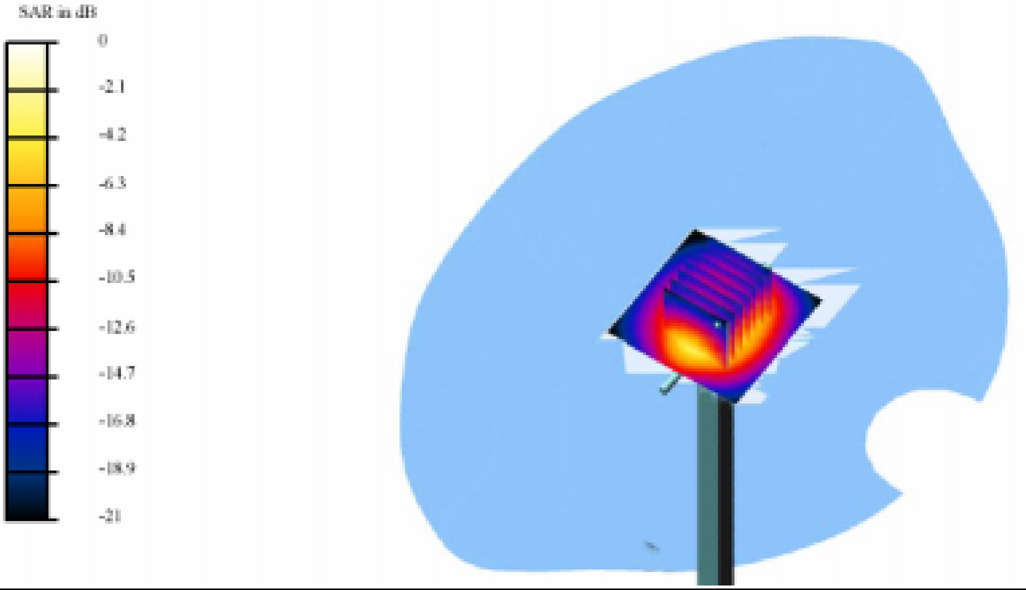
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: System Performance Check Muscle 2450MHz.da4

DUT: Dipole 2450 MHz Type & Serial Number: D2450V2 - SN:712
Program: SAR-00630; System Performance Check

Communication System: CW 2450MHz; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 2.02976 mho/m, ε_r = 51.2643, ρ = 1000 kg/m3)
Phantom section: FlatSection

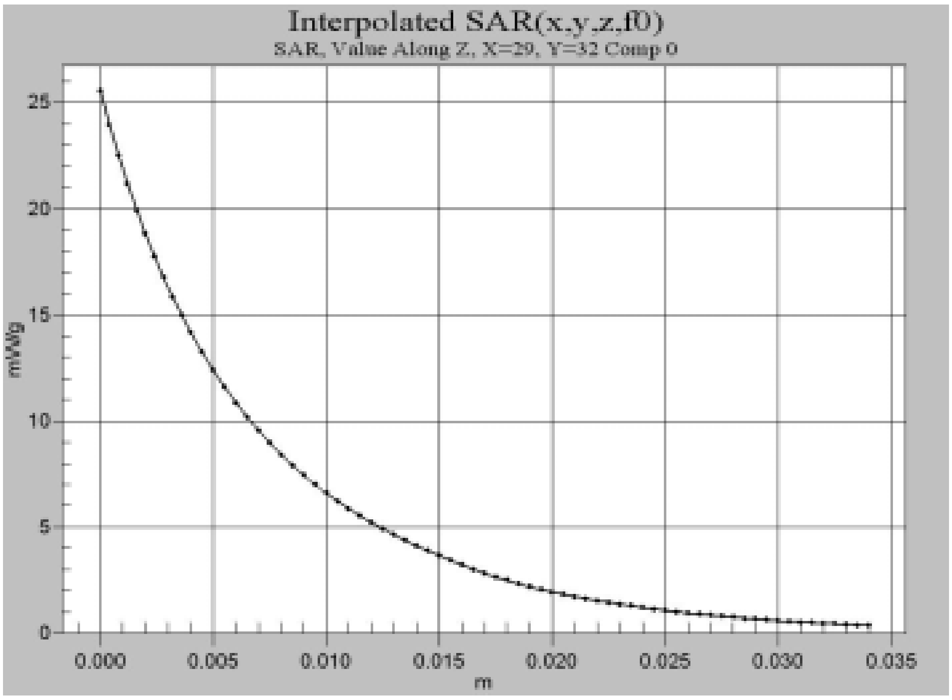
DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 90.7 V/m
Peak SAR = 28.6 mW/g
SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.39 mW/g
Power Drift = 0.004 dB

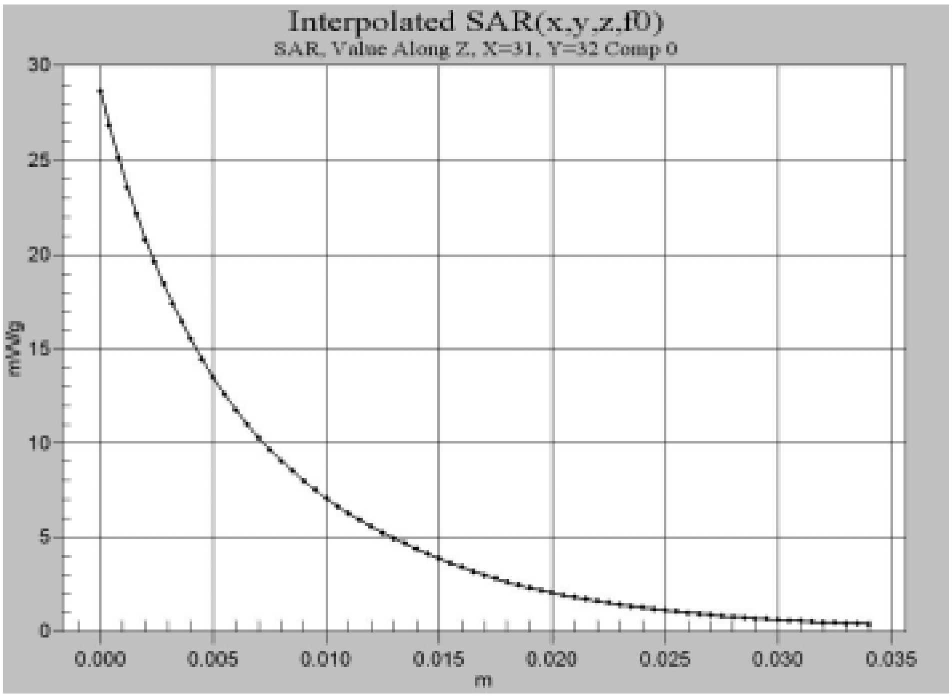


2003/04/22

Z-axis Plot of System Performance Check



2003/04/17



2003/04/22

Appendix B – SAR Measurement Data

Date/Time: 04/17/03 12:03:58

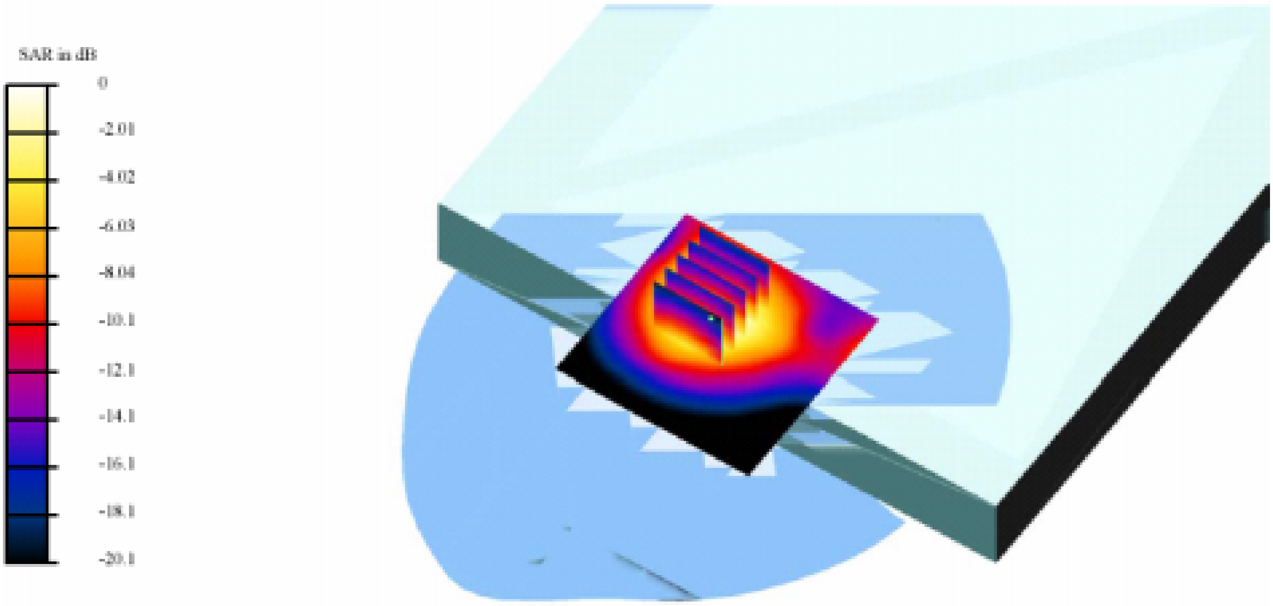
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Bottom REMOTEK WP320 802.11b Ch1.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Bottom

Communication System: 802-11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 1.94036 mho/m, ε_r = 51.7258, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 13.6 V/m
Peak SAR = 1.26 mW/g
SAR(1 g) = 0.609 mW/g; SAR(10 g) = 0.299 mW/g
Power Drift = 0.06 dB



SAR Test Result for Bottom Position – Channel 1

Date/Time: 04/17/03 12:23:26

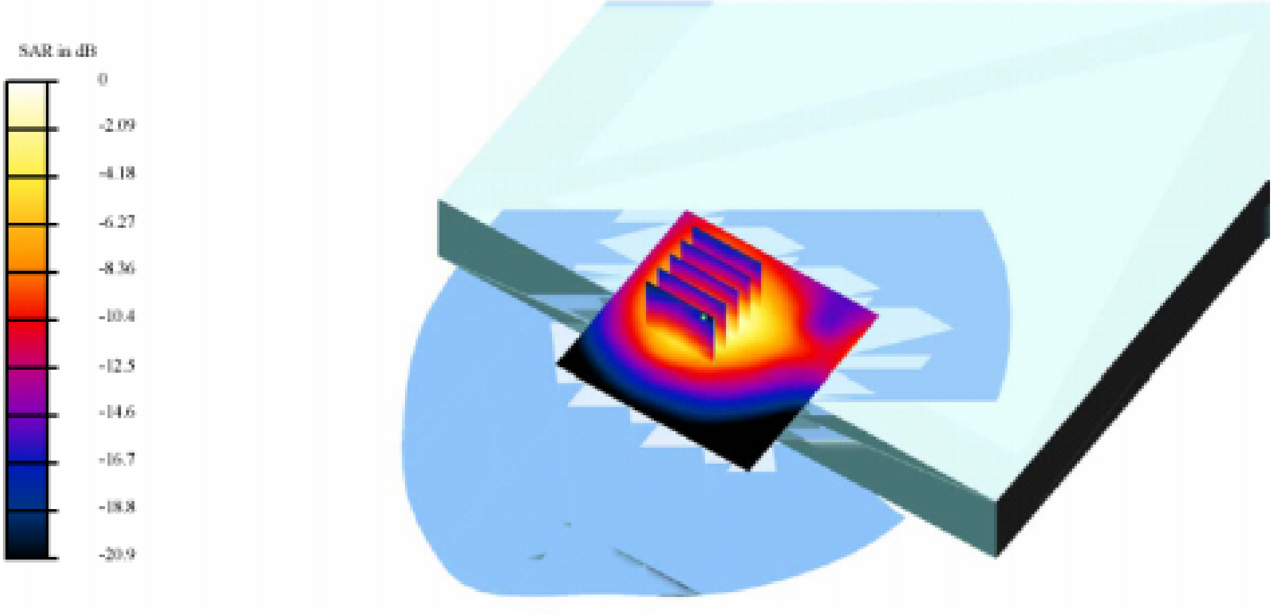
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Bottom REMOTEK WP320 802.11b Ch6.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Bottom

Communication System: 802-11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 1.97291 mho/m, ε = 51.6533, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 14.1 V/m
Peak SAR = 1.18 mW/g
SAR(1 g) = 0.564 mW/g; SAR(10 g) = 0.277 mW/g
Power Drift = -0.02 dB



SAR Test Result for Bottom Position – Channel 6

Date/Time: 04/22/03 23:53:39

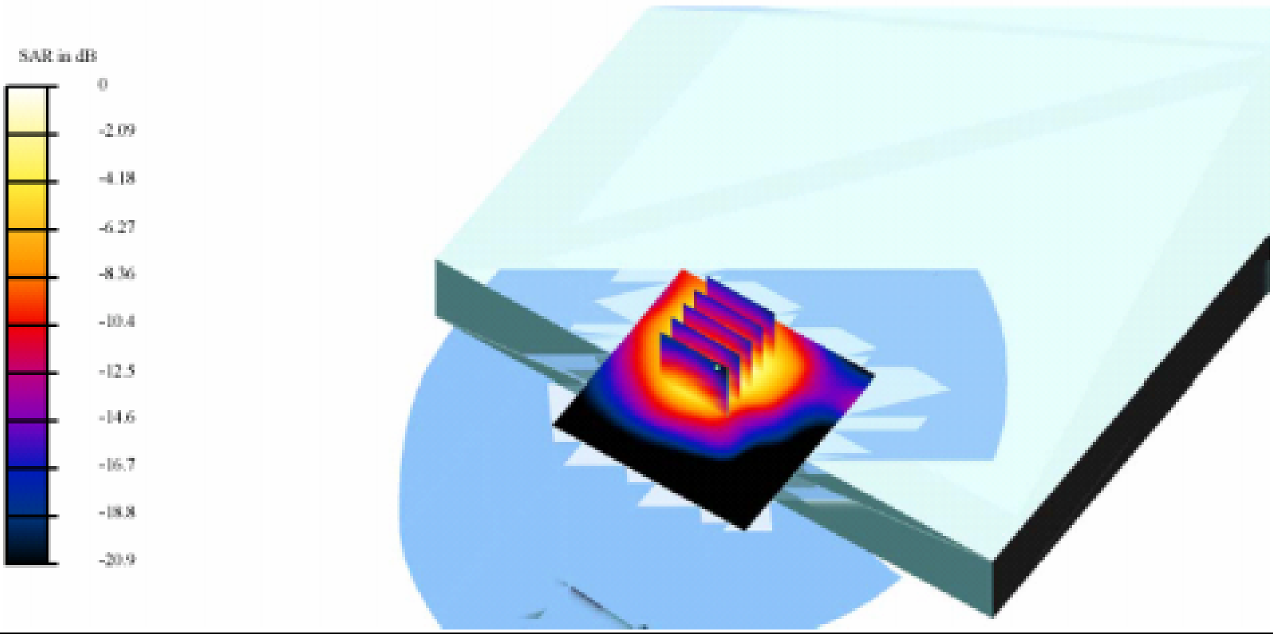
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Bottom REMOTEK WP320 802.11b Ch11.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Bottom

Communication System: 802-11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 2.0469 mho/m, ε_r = 51.2427, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 11.5 V/m
Peak SAR = 1.39 mW/g
SAR(1 g) = 0.663 mW/g; SAR(10 g) = 0.328 mW/g
Power Drift = -0.3 dB



SAR Test Result for Bottom Position – Channel 11

Date/Time: 04/22/03 19:41:27

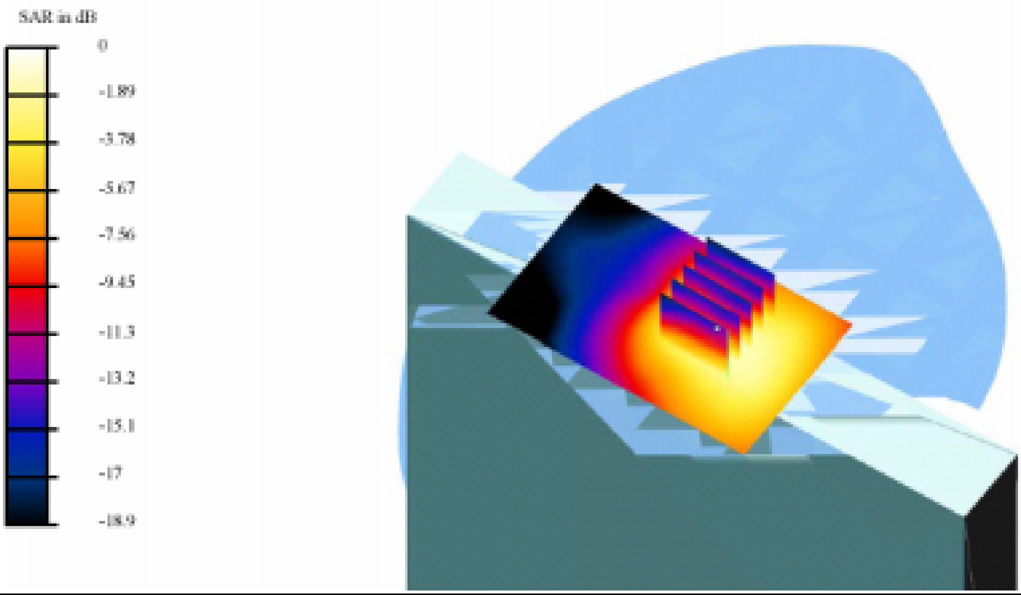
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Left Side REMOTEK WP320 802.11b Ch1.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Left Side

Communication System: 802-11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 1.98083 mho/m, ε_r = 51.3824, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 10.3 V/m
Peak SAR = 0.386 mW/g
SAR(1 g) = 0.185 mW/g; SAR(10 g) = 0.0939 mW/g
Power Drift = 0.01 dB
Area Scan (81x51x1): Measurement grid: dx=15mm, dy=15mm



SAR Test Result for Left Side Position – Channel 1

Date/Time: 04/22/03 20:45:04

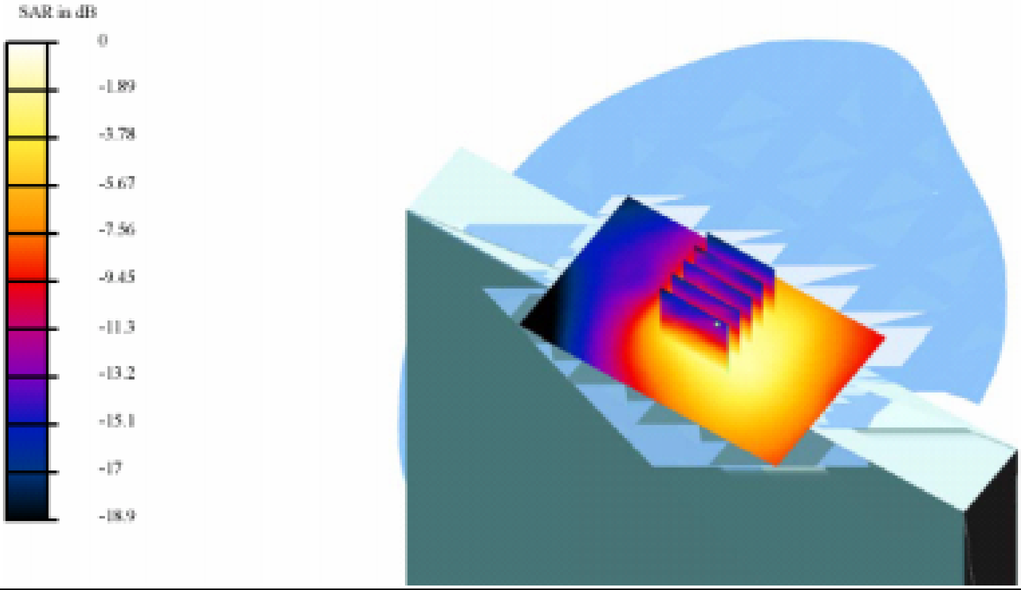
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Left Side REMOTEK WP320 802.11b Ch6-1.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Left Side

Communication System: 802-11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 2.01351 mho/m, ε_r = 51.3093, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (81x51x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 9.62 V/m
Peak SAR = 0.32 mW/g
SAR(1 g) = 0.149 mW/g; SAR(10 g) = 0.074 mW/g
Power Drift = -0.02 dB



SAR Test Result for Left Side Position – Channel 6

Date/Time: 04/22/03 21:42:37

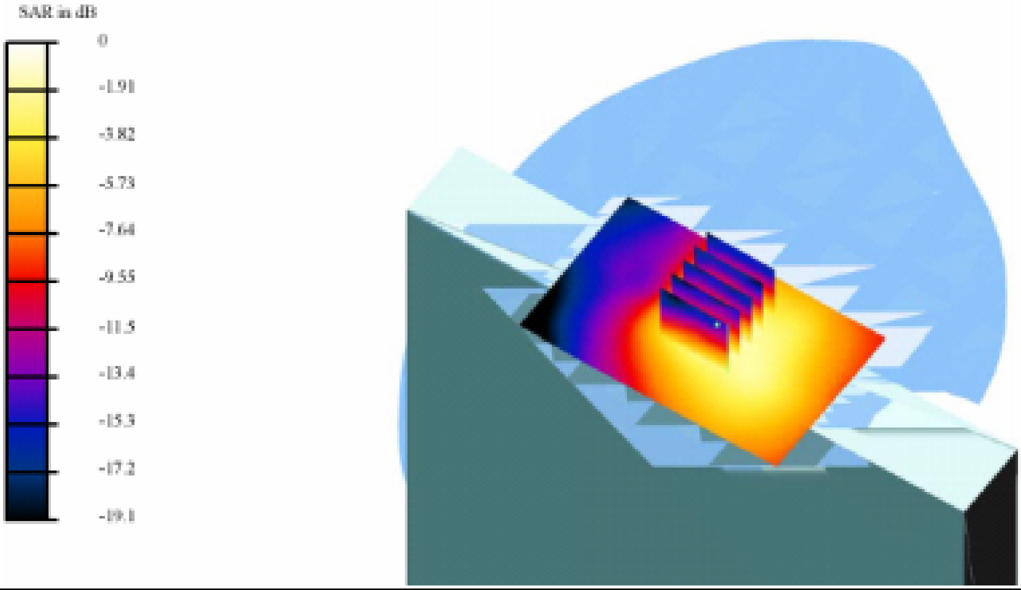
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Left Side REMOTEK WP320 802.11b Ch11.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Left Side

Communication System: 802-11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 2.0469 mho/m, ε_r = 51.2427, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (81x51x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 9.24 V/m
Peak SAR = 0.301 mW/g
SAR(1 g) = 0.139 mW/g; SAR(10 g) = 0.0688 mW/g
Power Drift = -0.09 dB



SAR Test Result for Left Side Position – Channel 11

Date/Time: 04/22/03 22:38:50

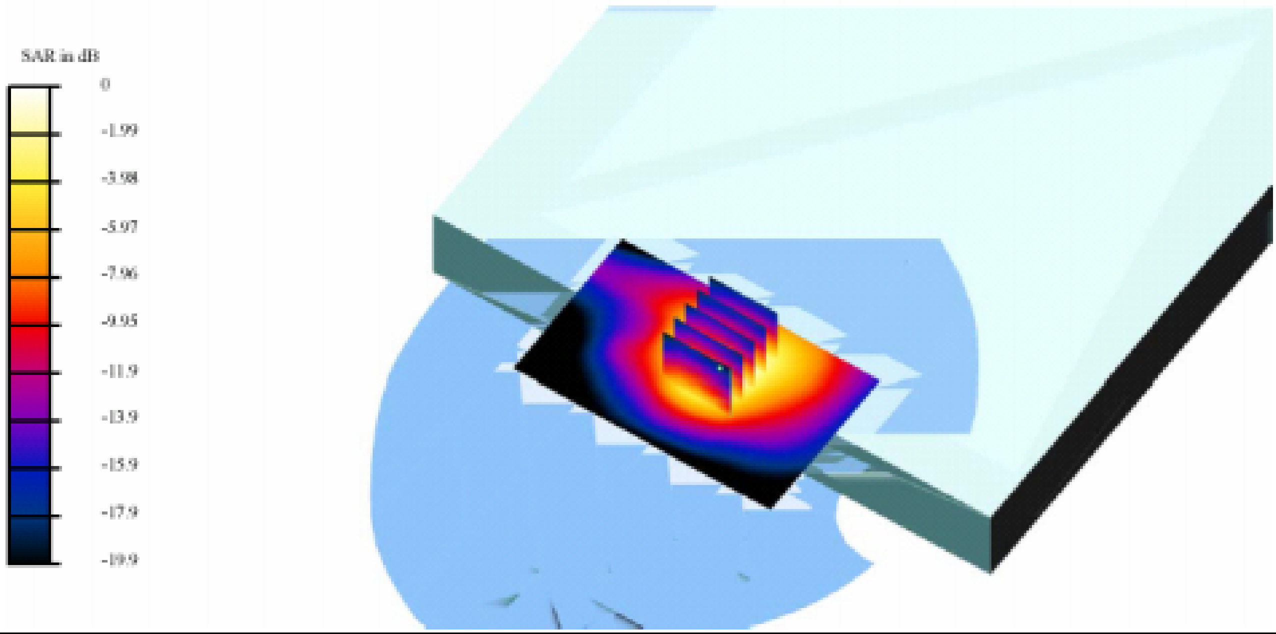
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Top REMOTEK WP320 802.11b Ch1.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Top

Communication System: 802-11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 1.98083 mho/m, ε = 51.3824, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (81x51x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 12.5 V/m
Peak SAR = 1.18 mW/g
SAR(1 g) = 0.561 mW/g; SAR(10 g) = 0.271 mW/g
Power Drift = -0.2 dB



SAR Test Result for Top Position – Channel 1

Date/Time: 04/22/03 22:57:41

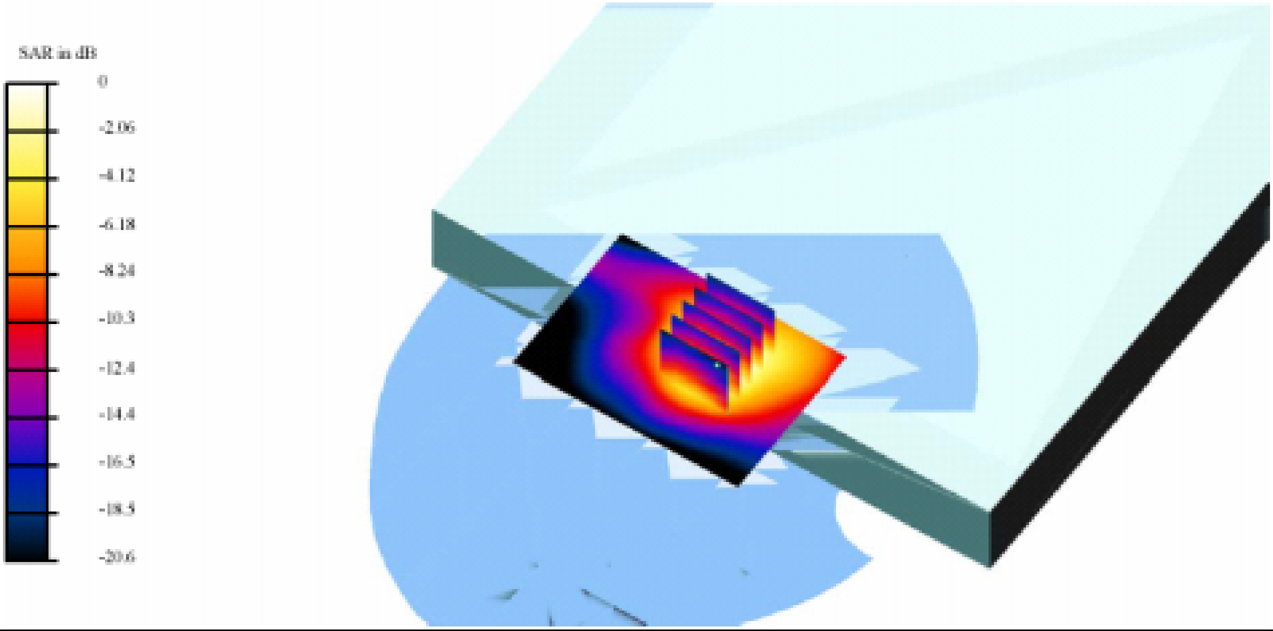
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Top REMOTEK WP320 802.11b Ch6.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Top

Communication System: 802-11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 2.01351 mho/m, ε = 51.3093, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (71x51x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 12.2 V/m
Peak SAR = 1.14 mW/g
SAR(1 g) = 0.535 mW/g; SAR(10 g) = 0.258 mW/g
Power Drift = -0.09 dB



SAR Test Result for Top Position – Channel 6

Date/Time: 04/22/03 23:14:49

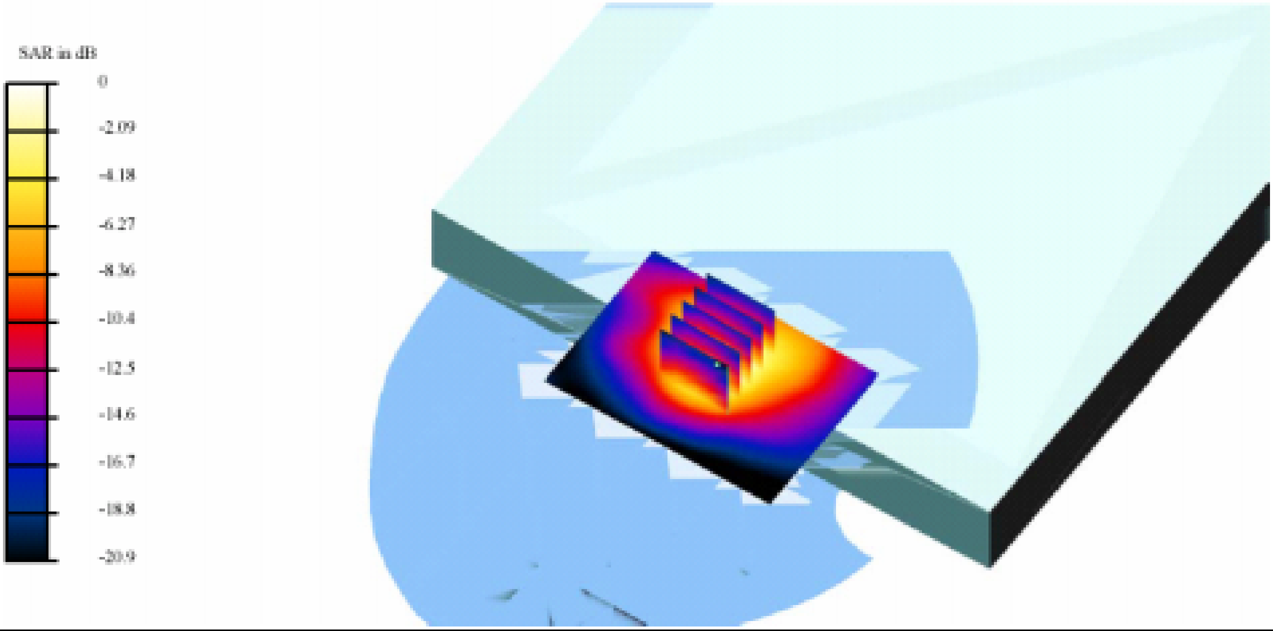
Test Laboratory: Auden Techno. Corp. RF Testing Lab
File Name: Top REMOTEK WP320 802.11b Ch11.da4

DUT: REMOTEK WP320 Type & Serial Number: 9204000A5000D000
Program: SAR-00630; Top

Communication System: 802-11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: Body 2450MHz (σ = 2.0469 mho/m, ε_r = 51.2427, ρ = 1000 kg/m3)
Phantom section: FlatSection

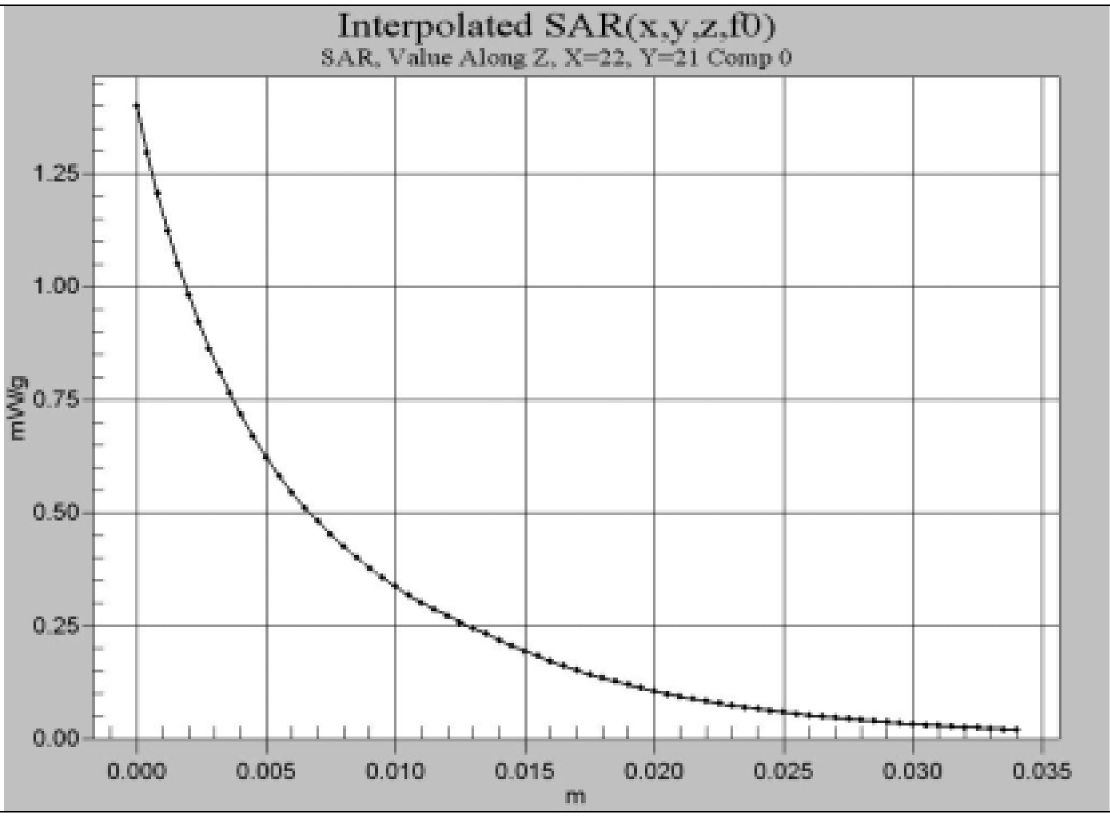
DASY4 Configuration:
- Probe: ET3DV6 - SN1531; ConvF(4.5, 4.5, 4.5); Calibrated: 8/27/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 4.0 - TP:1009
- Software: DASY4, V4.1 Build 33

Area Scan (71x51x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm
Reference Value = 11.7 V/m
Peak SAR = 1.2 mW/g
SAR(1 g) = 0.571 mW/g; SAR(10 g) = 0.271 mW/g
Power Drift = 0.2 dB



SAR Test Result for Top Position – Channel 11

Z-axis Plot for Maximum SAR



SAR Test Result for Bottom Position – Channel 11

Appendix C – Dipole Calibration

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

DASY

Dipole Validation Kit

Type: D2450V2

Serial: 712

Manufactured: July 5, 2002
Calibrated: July 15, 2002

1. Measurement Conditions

The measurements were performed in the flat section of the new SAM twin phantom filled with head simulating solution of the following electrical parameters at 2450 MHz:

Relative permitivity	**38.3**	± 5%
Conductivity	**1.90 mho/m**	± 10%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 5.0 at 2450 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2.1. SAR Measurement with DASY3 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the worst-case extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **58.0 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **26.6 mW/g**

2.2 SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **54.8 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **25.4 mW/g**

3. Dipole impedance and return loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.155 ns**	(one direction)
Transmission factor:	**0.986**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 2450 MHz:	Re{Z} = **51.2 Ω**
	Im {Z} = **2.7 Ω**
Return Loss at 2450 MHz	**- 30.7 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the new SAM twin phantom filled with body simulating solution of the following electrical parameters at 2450 MHz:

Relative permitivity	**51.7**	± 5%
Conductivity	**2.01 mho/m**	± 10%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 4.5 at 2450 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

5.1. SAR Measurement with DASY3 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the worst-case extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **57.6 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **26.8 mW/g**

5.2 SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **52.0 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **25.0 mW/g**

6. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

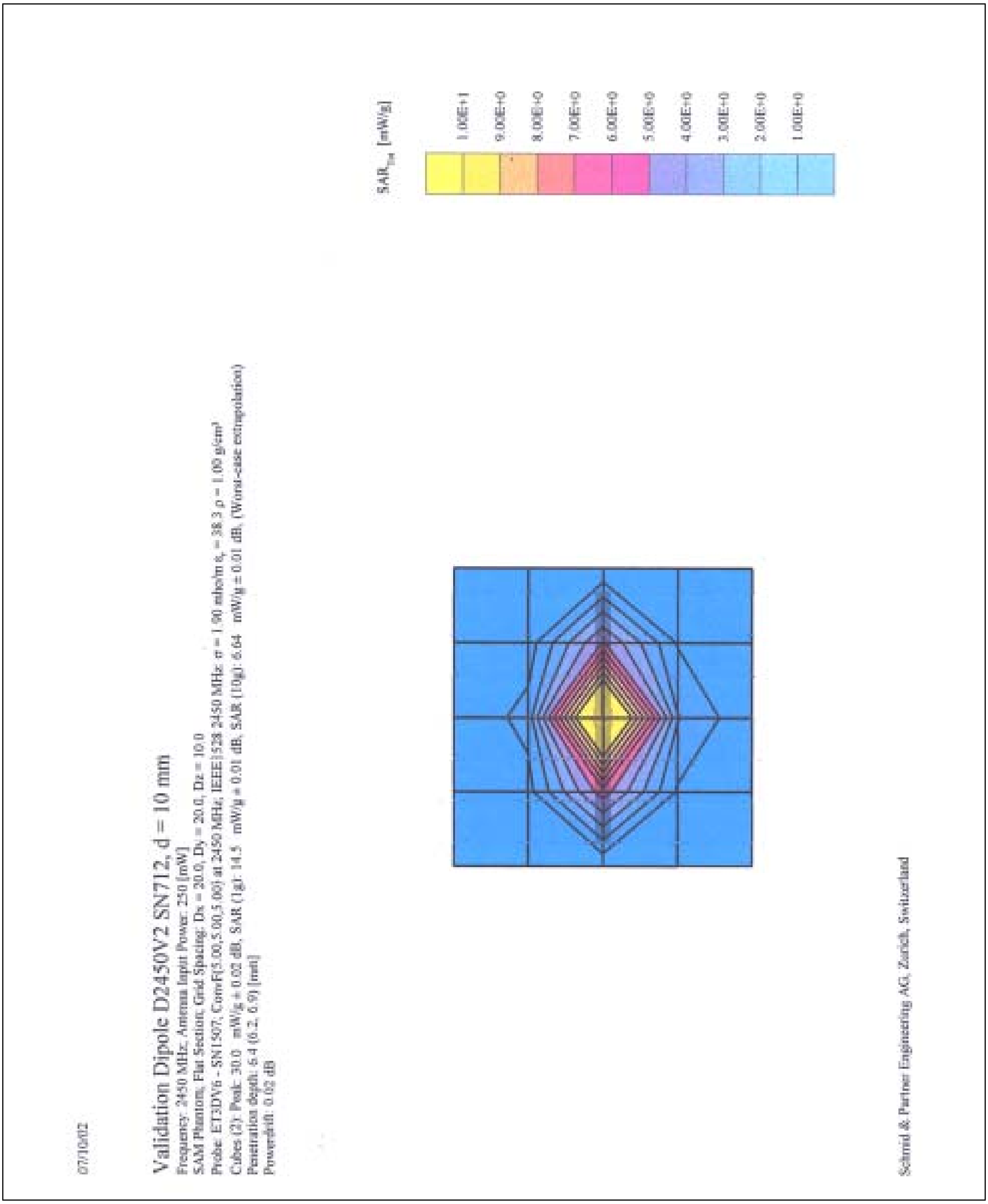
7. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Section 1. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

8. Power Test

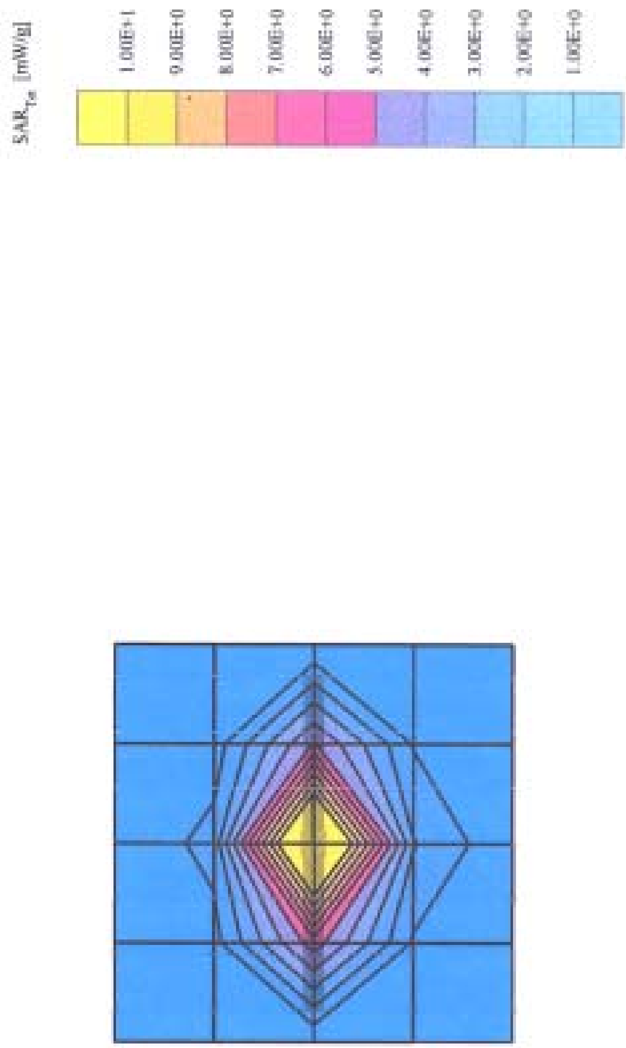
After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.


07/10/02
Validation Dipole D2450V2 SN712, d = 10 mm
Frequency: 2450 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.00,5.00,5.00) at 2450 MHz; IEEE1528 2450 MHz: σ = 1.90 mho/m εr = 38.3 ρ = 1.00 g/cm³
Cubes (2): Peak: 30.0 mW/g ± 0.02 dB, SAR (1g): 14.5 mW/g ± 0.01 dB, SAR (10g): 6.64 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 6.4 (6.2, 6.9) [mm]
Powerdrift: 0.02 dB
SAR Tot [mW/g]
1.00E+1
9.00E+0
8.00E+0
7.00E+0
6.00E+0
5.00E+0
4.00E+0
3.00E+0
2.00E+0
1.00E+0
Schmid & Partner Engineering AG, Zurich, Switzerland

07/10/02

Validation Dipole D2450V2 SN712, d = 10 mm

Frequency: 2450 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.00,5.00,5.00) at 2450 MHz; IEEE1528 2450 MHz: σ = 1.90 mho/m ε_r = 38.3 ρ = 1.00 g/cm³
Cubes (2): Peak: 27.4 mW/g ± 0.02 dB, SAR (1g): 13.7 mW/g ± 0.01 dB, SAR (10g): 6.34 mW/g ± 0.01 dB, (Advanced extrapolation)
Penetration depth: 6.7 (6.6, 7.0) [mm]
Powerdrift: 0.02 dB



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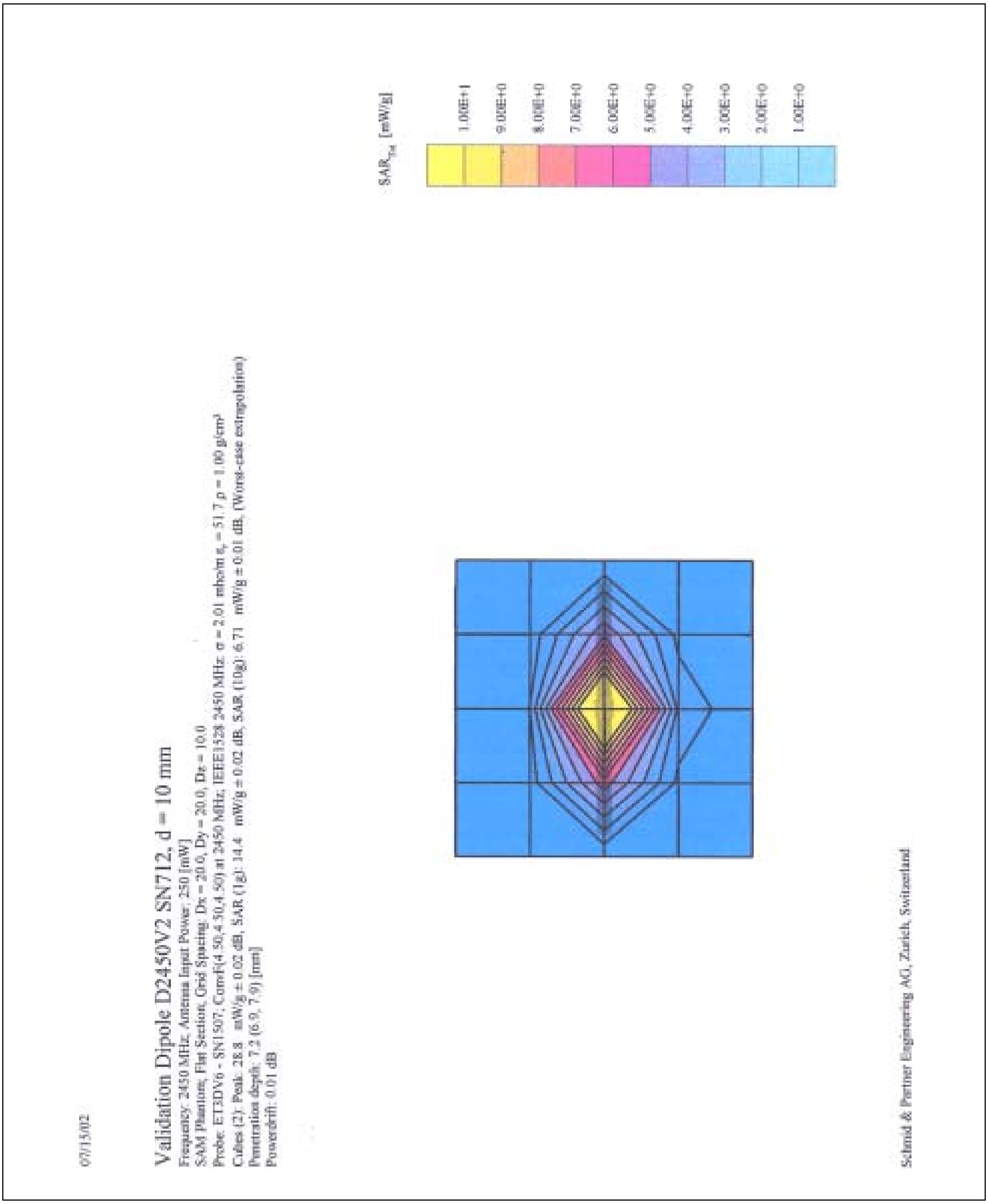
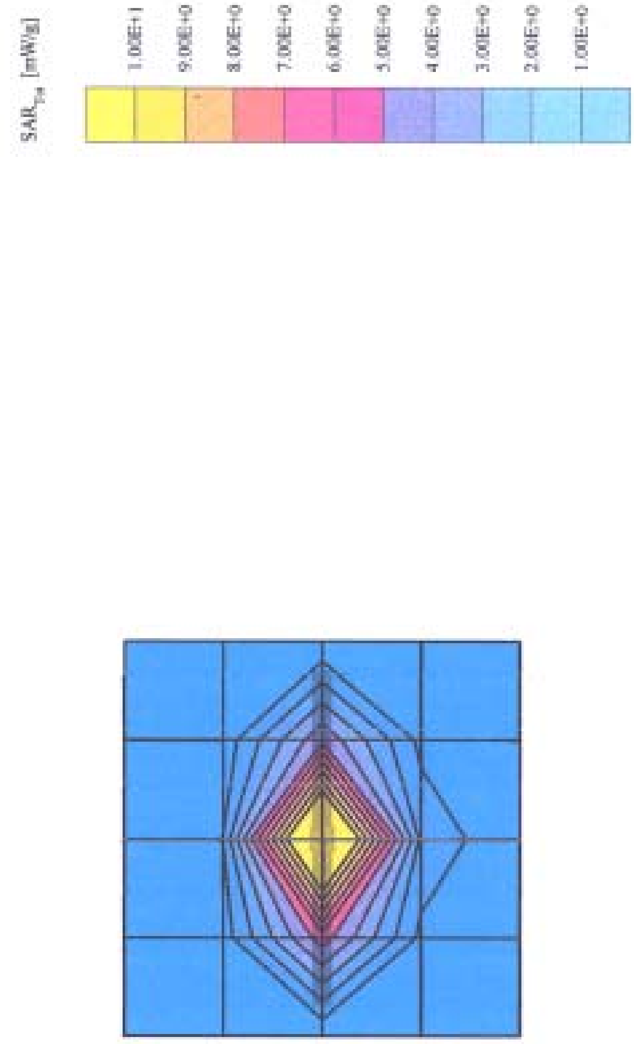

07/15/02
Validation Dipole D2450V2 SN712, d = 10 mm
Frequency: 2450 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(4.50,4.50,4.50) at 2450 MHz; IEEE1528 2450 MHz: σ = 2.01 mho/m εr = 51.7 ρ = 1.00 g/cm³
Cubes (2): Peak: 28.8 mW/g ± 0.02 dB, SAR (1g): 14.4 mW/g ± 0.02 dB, SAR (10g): 6.71 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 7.3 (6.9, 7.9) [mm]
Powerdrift: 0.01 dB
SAR Tot [mW/g]
1.00E+1
9.00E+0
8.00E+0
7.00E+0
6.00E+0
5.00E+0
4.00E+0
3.00E+0
2.00E+0
1.00E+0
Schmid & Partner Engineering AG, Zurich, Switzerland

07/15/02

Validation Dipole D2450V2 SN712, d = 10 mm
Frequency: 2450 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(4.50,4.50,4.50) at 2450 MHz; IEEE1528 2450 MHz: σ = 2.01 mho/m ε_r = 51.7 ρ = 1.00 g/cm³
Cubes (2): Peak: 24.7 mW/g ± 0.02 dB, SAR (1g): 13.0 mW/g ± 0.02 dB, SAR (10g): 6.24 mW/g ± 0.01 dB, (Advanced extrapolation)
Penetration depth: 7.8 (7.7, 8.1) [mm]
Powerdrift: 0.01 dB



Schmid & Partner Engineering AG, Zurich, Switzerland

Appendix D – Probe Calibration

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1531**
Place of Calibration:	**Zurich**
Date of Calibration:	**August 27, 2002**
Calibration Interval:	**12 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	N.Vetterli
Approved by:	[signature]

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Telephone +41 1 245 97 00, Fax +41 1 245 97 79

Probe ET3DV6

SN:1531

Manufactured:	July 15, 2000
Last calibration:	September 24, 2001
Recalibrated:	August 27, 2002

Calibrated for System DASY3

ET3DV6 SN:1531 August 27, 2002

DASY3 - Parameters of Probe: ET3DV6 SN:1531

Sensitivity in Free Space

NormX	1.43	μV/(V/m)^2
NormY	1.47	μV/(V/m)^2
NormZ	1.51	μV/(V/m)^2

Diode Compression

DCP X	97	mV
DCP Y	97	mV
DCP Z	97	mV

Sensitivity in Tissue Simulating Liquid

Head	900 MHz	ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m
Head	835 MHz	ε_r = 41.5 ± 5%	σ = 0.90 ± 5% mho/m

ConvF X	6.3	± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.3	± 9.5% (k=2)	Alpha	0.38
ConvF Z	6.3	± 9.5% (k=2)	Depth	2.57

Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m
Head	1900 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m

ConvF X	5.3	± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.3	± 9.5% (k=2)	Alpha	0.57
ConvF Z	5.3	± 9.5% (k=2)	Depth	2.27

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	10.4	5.9
SAR_{be} [%]	With Correction Algorithm	0.4	0.6

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	12.4	8.0
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.3 ± 0.2	mm

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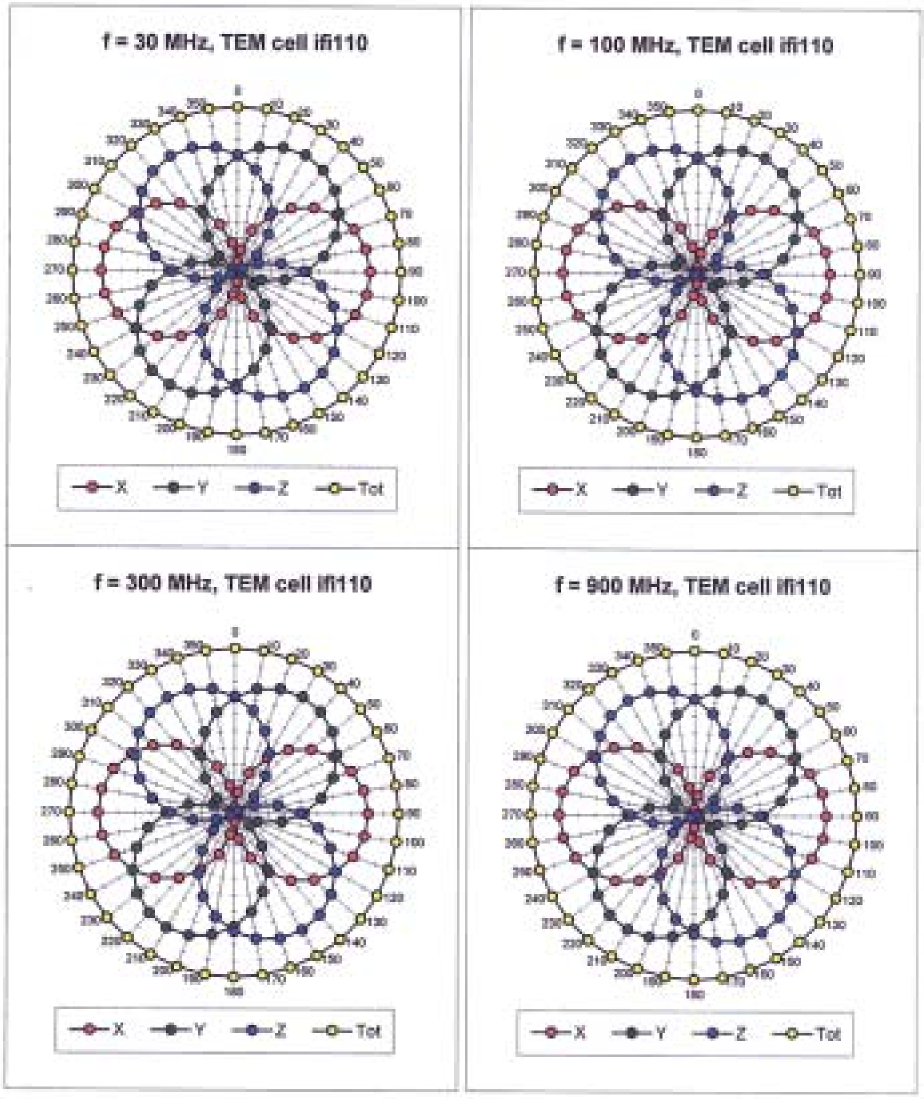
ET3DV6 SN:1531

August 27, 2002

Receiving Pattern (φ), θ = 0°



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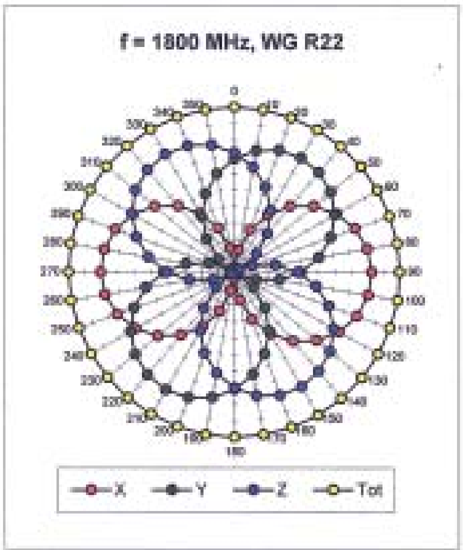
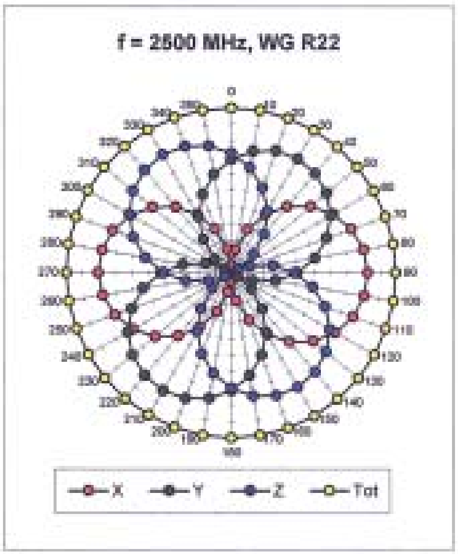
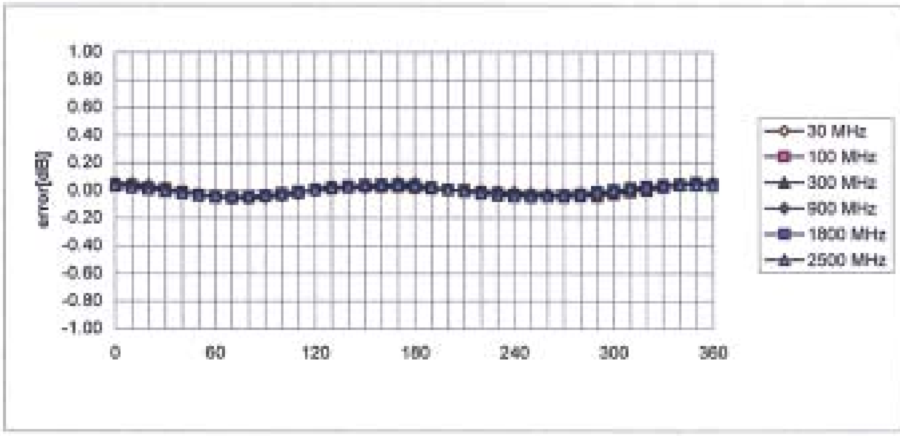
ET3DV6 SN:1531 August 27, 2002





Isotropy Error (ϕ), θ = 0°



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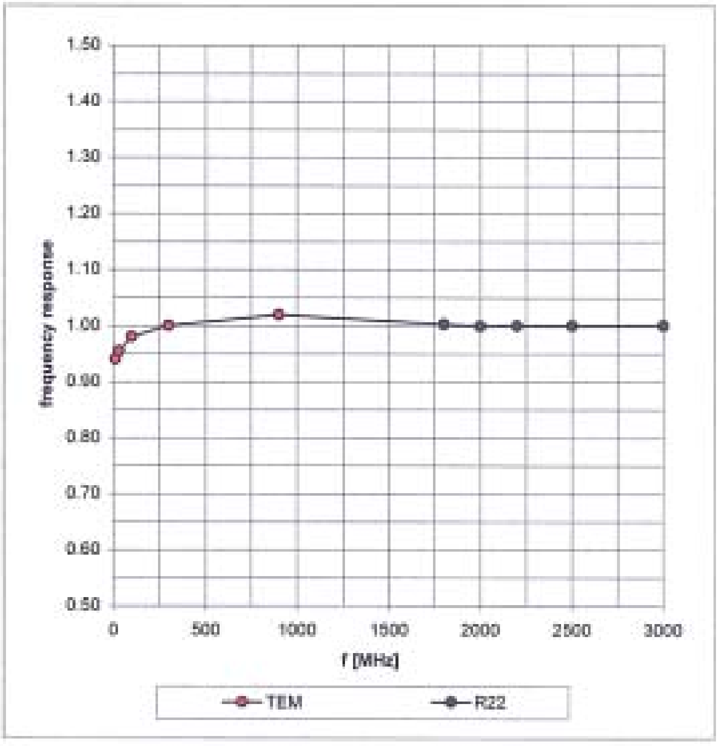
ET3DV6 SN:1531

August 27, 2002

Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)



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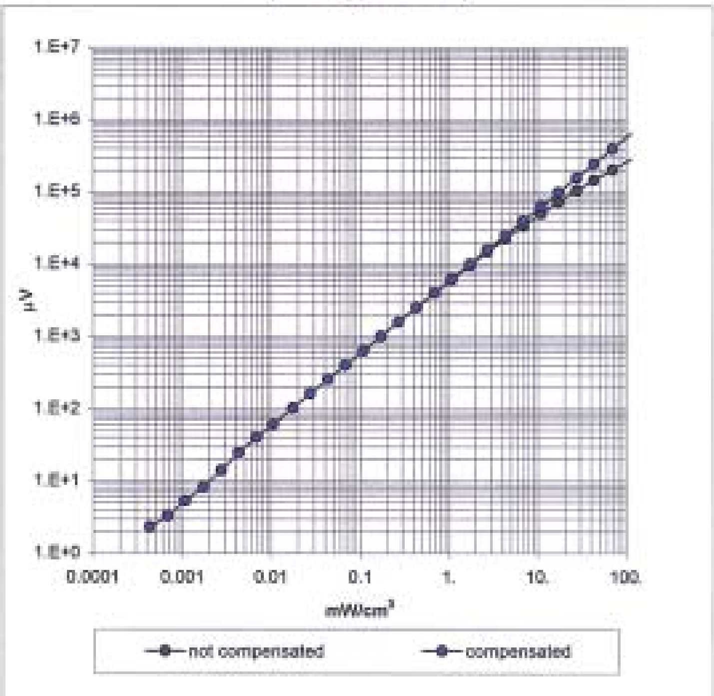
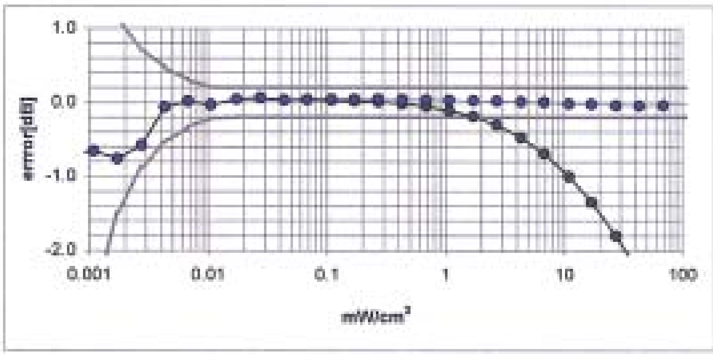
ET3DV6 SN:1531 August 27, 2002

Dynamic Range f(SAR_{brain})

(Waveguide R22)





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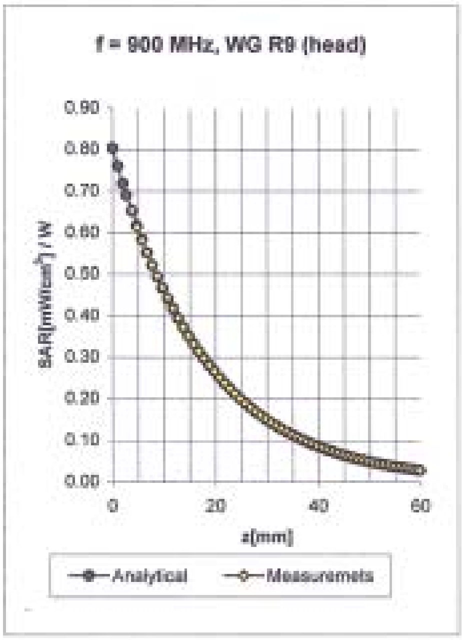
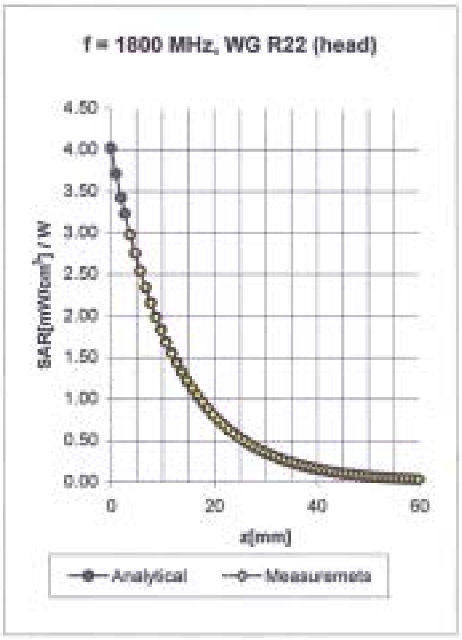
ET3DV6 SN:1531 August 27, 2002

Conversion Factor Assessment





Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

ConvF X	6.3	± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.3	± 9.5% (k=2)	Alpha	0.38
ConvF Z	6.3	± 9.5% (k=2)	Depth	2.57

Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

ConvF X	5.3	± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.3	± 9.5% (k=2)	Alpha	0.57
ConvF Z	5.3	± 9.5% (k=2)	Depth	2.27

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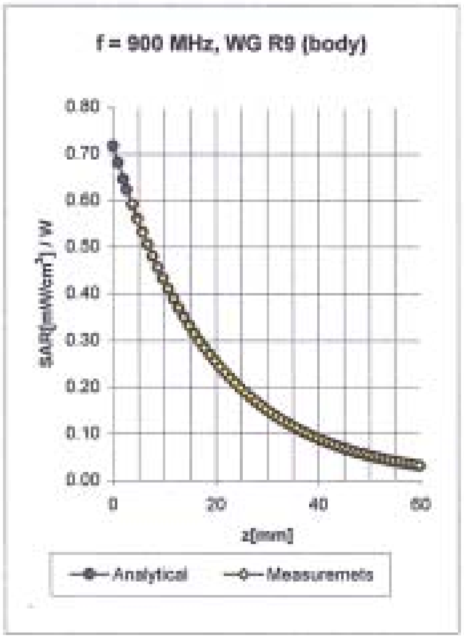
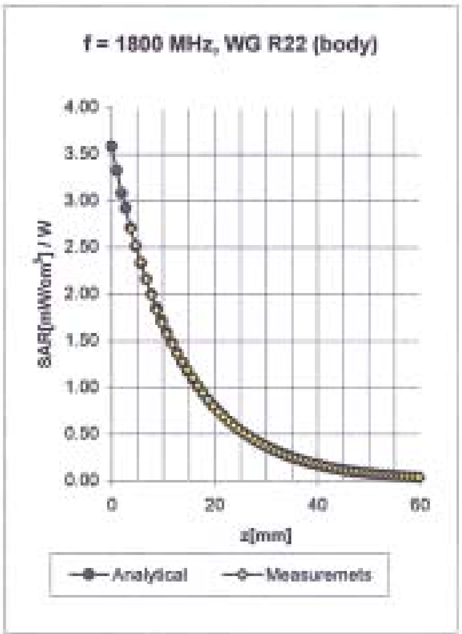
ET3DV6 SN:1531 August 27, 2002

Conversion Factor Assessment





Body	900 MHz	ε_r = 55.0 ± 5%	σ = 1.05 ± 5% mho/m

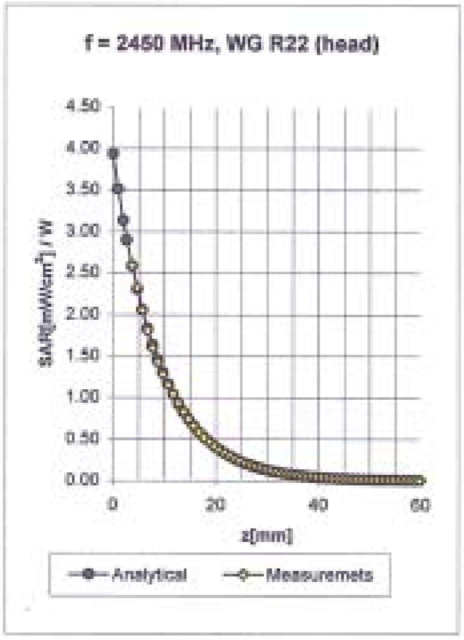
ConvF X	6.1	± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.1	± 9.5% (k=2)	Alpha	0.42
ConvF Z	6.1	± 9.5% (k=2)	Depth	2.46

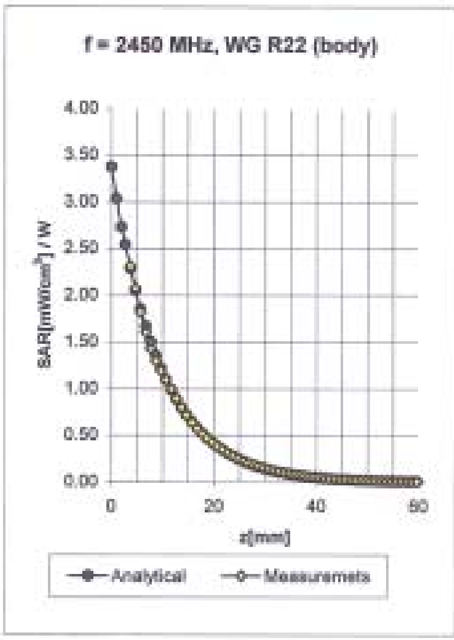
Body	1800 MHz	ε_r = 53.3 ± 5%	σ = 1.52 ± 5% mho/m

ConvF X	5.1	± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.1	± 9.5% (k=2)	Alpha	0.68
ConvF Z	5.1	± 9.5% (k=2)	Depth	2.18

ET3DV6 SN:1531 August 27, 2002

Conversion Factor Assessment





2450	Head	MHz	ε_r = 39.2 ± 5%	σ = 1.80 ± 5% mho/m	
	ConvF X	4.9	± 8.9% (k=2)	Boundary effect:	
	ConvF Y	4.9	± 8.9% (k=2)	Alpha	1.00
	ConvF Z	4.9	± 8.9% (k=2)	Depth	1.70

2450	Body	MHz	ε_r = 52.7 ± 5%	σ = 1.95 ± 5% mho/m	
	ConvF X	4.5	± 8.9% (k=2)	Boundary effect:	
	ConvF Y	4.5	± 8.9% (k=2)	Alpha	1.00
	ConvF Z	4.5	± 8.9% (k=2)	Depth	1.66

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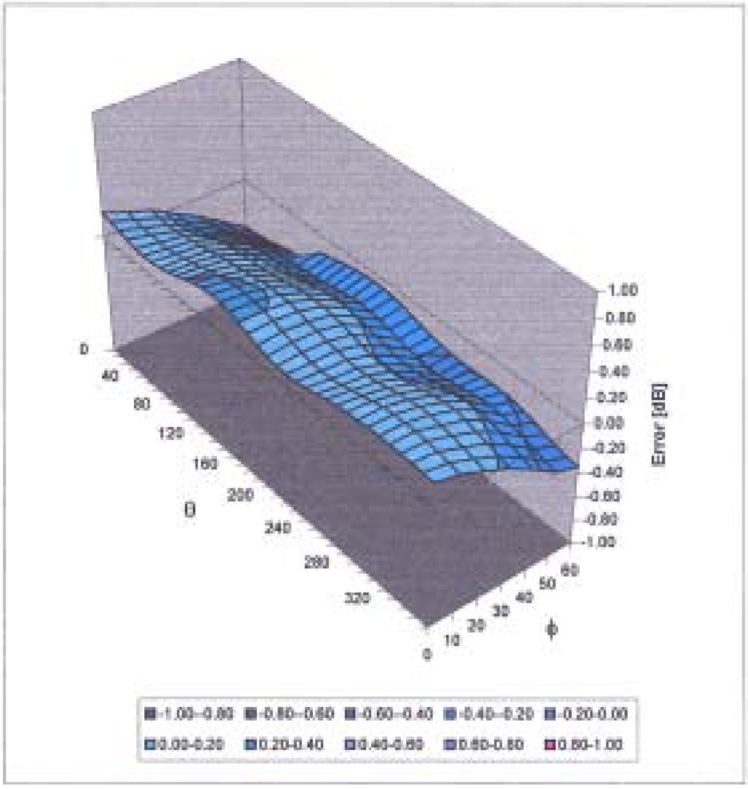
ET3DV6 SN:1531 August 27, 2002

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



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IMPORTANT NOTICE

USAGE OF PROBES IN ORGANIC SOLVENTS

Diethylene Gycol Monobuthy Ether (the basis for HSL1800 and M1800 liquids), as many other organic solvents, is a very effective softener for synthetic materials. These solvents can cause irreparable damage to certain SPEAG products, except those which are explicitly declared as compliant with organic solvents.

Compatible Probes:
- ET3DV6
- ET3DV6R
- ES3DV2
- ER3DV6
- H3DV6

Important Note for ET3DV6 Probes:
The ET3DV6 probes shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.

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Schmid & Partner Engineering AG

合 格

Technical Note 01.06.15-1 June 2002

Appendix E – Data Acquisition Electronic (DAE) Calibration

Schmid & Partner
Engineering AG

DASY - DOSIMETRIC ASSESSMENT SYSTEM

CALIBRATION REPORT

DATA ACQUISITION ELECTRONICS

MODEL:	DAE3 V1
SERIAL NUMBER:	393

This Data Acquisition Unit was calibrated and tested using a FLUKE 702 Process Calibrator. Calibration and verification were performed at an ambient temperature of 23 ± 5 °C and a relative humidity of < 70%.

Measurements were performed using the standard DASY software for converting binary values, offset compensation and noise filtering. Software settings are indicated in the reports.

Results from this calibration relate only to the unit calibrated.

Calibrated by:	Storchenegger
Calibration Date:	18.12, 2002
DASY Software Version:	DASY3 V3.1c

Dae393c

1. DC Voltage Measurement

DA - Converter Values from DAE

High Range:	1LSB =	6.1μV ,	full range =	400 mV
Low Range:	1LSB =	61nV ,	full range =	4 mV

Software Set-up: Calibration time: 3 sec   Measuring time: 3 sec

Setup	X	Y	Z
High Range	404.0746844	404.3390978	404.1879964
Low Range	3.97137	3.94142	3.95498
Connector Position	19 °		

High Range	Input	Reading in μV	% Error
Channel X + Input	200mV	199999.6	0.00
	20mV	19995.32	-0.02
Channel X - Input	20mV	-19993.79	-0.03
Channel Y + Input	200mV	199999.5	0.00
	20mV	19993.39	-0.03
Channel Y - Input	20mV	-19994.02	-0.03
Channel Z + Input	200mV	200000	0.00
	20mV	19994.5	-0.03
Channel Z - Input	20mV	-20003.01	0.02

Low Range	Input	Reading in μV	% Error
Channel X + Input	2mV	2000.05	0.00
	0.2mV	200.366	0.18
Channel X - Input	0.2mV	-200.379	0.19
Channel Y + Input	2mV	2000.02	0.00
	0.2mV	199.114	-0.44
Channel Y - Input	0.2mV	-200.753	0.38
Channel Z + Input	2mV	2000.02	0.00
	0.2mV	199.202	-0.40
Channel Z - Input	0.2mV	-201.2	0.60

Dae393c

2. Common mode sensitivity

Software Set-up
Calibration time: 3 sec, Measuring time: 3 sec
High/Low Range

in µV	Common mode Input Voltage	High Range Reading	Low Range Reading
Channel X	200mV	11.5195	10.6443
	- 200mV	-9.45899	-10.7877
Channel Y	200mV	8.8208	9.04838
	- 200mV	-10.7208	-10.4891
Channel Z	200mV	2.57815	2.58048
	- 200mV	-3.83723	-5.33249

3. Channel separation

Software Set-up
Calibration time: 3 sec, Measuring time: 3 sec
High Range

in µV	Input Voltage	Channel X	Channel Y	Channel Z
Channel X	200mV	-	3.87894	-0.249448
Channel Y	200mV	0.754446	-	5.51548
Channel Z	200mV	-1.16639	0.548042	-

4. AD-Converter Values with inputs shorted

in LSB	Low Range	High Range
Channel X	15563	16112
Channel Y	15059	15995
Channel Z	17960	16464

Dae393c

5. Input Offset Measurement

Measured after 15 min warm-up time of the Data Acquisition Electronic.
Every Measurement is preceded by a calibration cycle.

Software set-up:
Calibration time: 3 sec
Measuring time: 3 sec
Number of measurements: 100, Low Range

Input 10MΩ

in µV	Average	min. Offset	max. Offset	Std. Deviation
Channel X	0.83	-0.63	2.29	0.31
Channel Y	-1.70	-3.57	-0.50	0.32
Channel Z	-0.63	-2.32	0.23	0.30

Input shorted

in µV	Average	min. Offset	max. Offset	Std. Deviation
Channel X	0.13	-0.34	0.56	0.16
Channel Y	-0.75	-1.29	-0.24	0.18
Channel Z	-1.06	-1.66	-0.49	0.18

6. Input Offset Current

in fA	Input Offset Current
Channel X	< 25
Channel Y	< 25
Channel Z	< 25

7. Input Resistance

	Calibrating	Measuring
Channel X	200 kΩ	200 MΩ
Channel Y	200 kΩ	200 MΩ
Channel Z	200 kΩ	200 MΩ

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8. Low Battery Alarm Voltage

in V	Alarm Level
Supply (+ Vcc)	7.36 V
Supply (- Vcc)	-7.32 V

9. Power Consumption

in mA	Switched off	Stand by	Transmitting
Supply (+ Vcc)	0.000	5.29	13.8
Supply (- Vcc)	-0.011	-7.58	-8.8

10. Functional test

Touch async pulse 1	ok
Touch async pulse 2	ok
Touch status bit 1	ok
Touch status bit 2	ok
Remote power off	ok
Remote analog Power control	ok
Modification Status	B – C

Date: 11.12.02 Signature: ....

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Appendix F – Photographs of Auxiliary Equipment


N160 C933X310DC12T8L TAI
5Y1CKHYZH01V 1YR
MODEL : Wise
470023-995
COMPAQ