



**No.** DAT-P-114/01-01

# TEST REPORT

No. SAR2006005-1

<b>Test name</b>	Electromagnetic Field (Specific Absorption Rate)
<b>Product</b>	GSM/WiFi Dual Mode Phone
<b>Model</b>	Paragon PW-1010
<b>Client</b>	Paragon Wireless Inc.
<b>Type of test</b>	Non Type Approval

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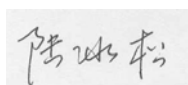
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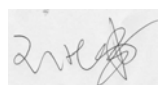
Product Name	GSM/WiFi Dual Mode Phone	Sample Model	Paragon PW-1010
Client	Paragon Wireless Inc.	Type of test	Non Type Approval
Factory	Tianjin Grand Electronics Co., Ltd	Sampling arrival date	April 13 <sup>th</sup> , 2006
Manufacturer	Paragon Wireless Inc.		
Sampling/ Sending sample	Sending sample	Sample sent by	Wang Wuji
Sampling location	/	Sampling person	/
Sample quantity	1	Sample matrix	/
Series number of the Sample	358054000001342		
Test basis	<p><b>EN 50360–2001:</b> Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p><b>EN 50361–2001:</b> Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.</p> <p><b>ANSI C95.1–1999:</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz</p> <p><b>IEEE 1528–2003:</b> Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.</p> <p><b>IEC 62209-2 (Draft):</b> Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the Body.</p> <p><b>OET Bulletin 65 (Edition 97-01) and Supplement C(Edition 01-01):</b> Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits.</p>		
Test conclusion	<p>Localized Specific Absorption Rate (SAR) of this portable wireless equipment has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.</p> <p>General Judgment: <b>Pass</b></p> <p style="text-align: right;">(Stamp)</p> <p style="text-align: right;"><b>Date of issue: June 15<sup>th</sup>, 2006</b></p>		
Note	The test results relate only to the items tested of the sample(s).		

Approved by



(Lu Minniu)

Reviewed by



(Wang Hongbo)

Tested by



(Qi Dianyuan)

Deputy Director of the laboratory

## **1 COMPETENCE AND WARRANTIES**

**Telecommunication Metrology Center of Ministry of Information Industry** is a test laboratory accredited by DAR (DATech) – Deutschen Akkreditierungs Rat (Deutsche Akkreditierungsstelle Technik) for the tests indicated in the Certificate No. **DAT-P-114/01-10**.

Telecommunication Metrology Center of Ministry of Information Industry is a test laboratory competent to carry out the tests described in this test report.

**Telecommunication Metrology Center of Ministry of Information Industry** guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at **Telecommunication Metrology Center of Ministry of Information Industry** at the time of execution of the test.

**Telecommunication Metrology Center of Ministry of Information Industry** is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test.

## **2 GENERAL CONDITIONS**

- 2.1 This report only refers to the item that has undergone the test.
- 2.2 This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities.
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## **3 DESCRIPTION OF EUT**

### **3.1 Addressing Information Related to EUT**

**Table 1: Applicant (The Client)**

Name or Company	Paragon Wireless Inc.
Address/Post	A-1801, E-wing Center, No.113 Zhichun Road, Haidian District, Beijing,
City	Beijing
Postal Code	100086
Country	P.R.China
Telephone	+86-10-62616660-270
Fax	+86-10-62616669

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**Table 2: Manufacturer**

Name or Company	Paragon Wireless Inc.
Address/Post	A-1801, E-wing Center, No.113 Zhichun Road, Haidian District, Beijing,
City	Beijing
Postal Code	100086
Country	P.R.China
Telephone	+86-10-62616660-270
Fax	+86-10-62616669

### 3.2 Constituents of EUT

**Table 3: Constituents of Samples**

Description	Model	Serial Number	Manufacturer
Handset	Paragon PW-1010	358054000001342	Tianjin Grand Electronics Co., Ltd
Lithium Battery	Twins	WD060201758	XWODA ELECTRONIC CO., LTD
AC/DC Adapter	PSC05R-050CP(PR)-R	TC05H4C00371	PHONE TECHNOLOGY CO., LTD



**Picture 1: Constituents of the sample (Lithium Battery is in the Handset)**

### 3.3 General Description

Equipment Under Test (EUT) is a model of GSM/WiFi Dual Mode phone with integrated antenna. It consists of Handset and normal options: Lithium Battery and AC/DC Adapter as Table 3 and Picture 1. With the request of the client, SAR is tested for WLAN test.

The sample undergoing test was selected by the Client.

Components list please refer to documents of the manufacturer

## 4 OPERATIONAL CONDITIONS DURING TEST

### 4.1 Schematic Test Configuration

A communication link is set up with the test mode software. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 1, 6 and 11 respectively in the case of 2450 MHz. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode.

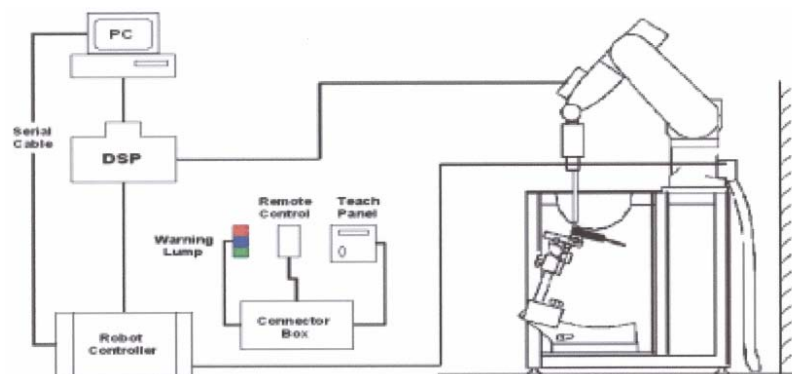
The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically

during the test to ascertain uniform power output.

## 4.2 SAR Measurement Set-up

These measurements were performed with the automated near-field scanning system DASY4 Professional 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  $\pm 0.02\text{mm}$ . 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, teaches pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the Micron Pentium III 800 MHz computer with Windows 2000 system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Stäubli 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 coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.



**Picture 2: SAR Lab Test Measurement Set-up**

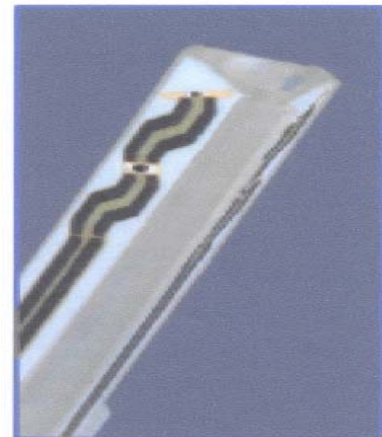
The DAE consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information 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.

## 4.3 Dasy4 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the standard procedure with an accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25\text{dB}$ .

### ET3DV6 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 and 1.8GHz (accuracy $\pm$ 8%) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz; Linearity: $\pm$ 0.2 dB (30 MHz to 3 GHz)
Directivity	$\pm$ 0.2 dB in brain tissue (rotation around probe axis) $\pm$ 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic Range	5u W/g to > 100mW/g; Linearity: $\pm$ 0.2dB
Surface Detection	$\pm$ 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



**Picture 3: ET3DV6 E-field Probe**



**Picture4:ET3DV6 E-field probe**

### 4.4 E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25\text{dB}$ . The sensitivity parameters (NormX, NormY, 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 below 1 GHz, and in a wave guide above 1 GHz 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:  $\Delta t$  = Exposure time (30 seconds),

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

$\Delta T$  = Temperature increase due to RF exposure.

Or

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

Where:  $\sigma$  = Simulated tissue conductivity,

$\rho$  = Tissue density (kg/m<sup>3</sup>).

Note: Please see Annex E to check the probe calibration certificate.



**Picture 5: Device Holder**

## **4.5 Other Test Equipment**

### **4.5.1 Device Holder for Transmitters**

In combination with the Generic Twin Phantom V3.0, 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 FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

### **4.5.2 Phantom**

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. 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 the evaporation of the liquid. Reference markings on the Phantom allow all predefined phantom positions and measurement grids by the complete setup of manually teaching three points in the robot.

Shell Thickness    2±0.1 mm

Filling Volume    Approx. 20 liters

Dimensions        810 x 1000 x 500 mm (H x L x W)

Available         Special



**Picture6: Generic Twin Phantom**

## **4.6 Equivalent Tissues**

The Table 4 shows the detail solution of the liquid used for the frequency of 2450 MHz. The liquid has previously been proven to be suited for worst-case. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET Bulletin 65 (Edition 97-01) and Supplement C (Edition 01-01).

**Table 4. Composition of the Body Tissue Equivalent Matter**

MIXTURE %	FREQUENCY 2450MHz
Water	68.64
Glycol monobutyl	31.36
Salt	0.00
Dielectric Parameters Target Value	f=2450MHz $\epsilon=53.6$ $\sigma=1.81$

## 4.7 System Specifications

### 4.7.1 Robotic System Specifications

#### Specifications

**Positioner:** Stäubli Unimation Corp. Robot Model: RX90L

**Repeatability:**  $\pm 0.02$  mm

**No. of Axis:** 6

#### Data Acquisition Electronic (DAE) System

##### Cell Controller

**Processor:** Pentium III

**Clock Speed:** 800 MHz

**Operating System:** Windows 2000

##### Data Converter

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

**Software:** DASY4 software

**Connecting Lines:** Optical downlink for data and status info.

Optical uplink for commands and clock

## 5 CHARACTERISTICS OF THE TEST

### 5.1 Applicable Limit Regulations

**EN 50360–2001:** Product standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.

It specifies the maximum exposure limit of **2.0 W/kg** as averaged over any 10 gram of tissue for portable devices being used within 20 mm of the user in the uncontrolled environment.

**ANSI C95.1–1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 mm of the user in the uncontrolled environment.

### 5.2 Applicable Measurement Standards

**EN 50361–2001:** Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones.

**IEC 62209-2 (Draft):** Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the body.

**IEEE 1528–2003:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.

**OET Bulletin 65 (Edition 97-01) and Supplement C (Edition 01-01):** Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits.

They specify the measurement method for demonstration of compliance with the SAR limits for such equipments.

## 6 LABORATORY ENVIRONMENT

**Table 5: The Ambient Conditions during EMF Test**

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 $\Omega$
Ambient noise is checked and found very low and in compliance with requirement of standards.	
Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

## 7 Maximum Peak Power Output

### 7.1 Method Of Test

This measurement applies to equipment with an integral antenna, equipment with an antenna connector, and equipped with an antenna as declared by the applicant. The power was measured with modulation (declared by the applicant).

### 7.2 Test Result

Test conditions	Mode	Channel 1	Channel 6	Channel 11
		[dBm]	[dBm]	[dBm]
T nom=25°C	802.11b	13.7	16.1	16.9
V nom=3.9V	802.11g	15.7	17.7	18.7

### 7.3 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 7 and 8 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

## 8 TEST RESULTS

### 8.1 Dielectric Performance

**Table 6: Dielectric Performance of Body Tissue Simulating Liquid**

Measurement is made at temperature 22.5 °C and relative humidity 49%. Liquid temperature during the test: 21.4°C			
/	Frequency	Permittivity $\epsilon$	Conductivity $\sigma$ (S/m)
Target value	2450MHz	53.6	1.81
Measurement value (Average of 10 tests)	2450MHz	51.23	1.89

### 8.2 Summary of Measurement Results

**Table 7: SAR Values (Head, 1900 MHz Band, Mode 802.11b)**

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		
	10 g Average	1 g Average	
Body Towards Ground, Top frequency(See Fig.1)	0.000107	0.001	0.200
Body Towards Ground, Mid frequency(See Fig.2)	0.000364	0.00157	-0.200
Body Towards Ground, Bottom frequency(See Fig.3)	0.000451	0.00298	-0.200

**Table 8: SAR Values (Head, 1900 MHz Band, Mode 802.11g)**

Limit of SAR (W/kg)	10 g Average	1 g Average	Power Drift (dB)
	2.0	1.6	
Test Case	Measurement Result (W/kg)		
	10 g Average	1 g Average	
Body Towards Ground, Top frequency(See Fig.4)	0.000149	0.00107	-0.200
Body Towards Ground, Mid frequency(See Fig.5)	0.000283	0.0024	-0.200
Body Towards Ground, Bottom frequency(See Fig.6)	0.000153	0.000571	-0.200

### 8.3 Conclusion

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.

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## 9 Measurement Uncertainty

SN	a	Type	c	d	e = f(d,k)	f	h = c x f / e	k
	Uncertainty Component		Tol. (± %)	Prob. Dist.	Div.	c <sub>i</sub> (1 g)	1 g u <sub>i</sub> (±%)	v <sub>i</sub>
1	System repetivity	A	0.5	N	1	1	0.5	9
Measurement System								
2	Probe Calibration	B	5	N	2	1	2.5	∞
3	Axial Isotropy	B	4.7	R	√3	(1-cp) 1/2	4.3	∞
4	Hemispherical Isotropy	B	9.4	R	√3	√c <sub>p</sub>		∞
5	Boundary Effect	B	0.4	R	√3	1	0.23	∞
6	Linearity	B	4.7	R	√3	1	2.7	∞
7	System Detection Limits	B	1.0	R	√3	1	0.6	∞
8	Readout Electronics	B	1.0	N	1	1	1.0	∞
9	RF Ambient Conditions	B	3.0	R	√3	1	1.73	∞
10	Probe Positioner Mechanical Tolerance	B	0.4	R	√3	1	0.2	∞
11	Probe Positioning with respect to Phantom Shell	B	2.9	R	√3	1	1.7	∞
12	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	√3	1	2.3	∞
Test sample Related								
13	Test Sample Positioning	A	4.9	N	1	1	4.9	N-1
14	Device Holder Uncertainty	A	6.1	N	1	1	6.1	N-1
15	Output Power Variation - SAR drift measurement	B	5.0	R	√3	1	2.9	∞
Phantom and Tissue Parameters								
16	Phantom Uncertainty (shape and thickness tolerances)	B	1.0	R	√3	1	0.6	∞
17	Liquid Conductivity - deviation from target values	B	5.0	R	√3	0.64	1.7	∞
18	Liquid Conductivity - measurement uncertainty	B	5.0	N	1	0.64	1.7	M
19	Liquid Permittivity - deviation from target values	B	5.0	R	√3	0.6	1.7	∞
20	Liquid Permittivity - measurement uncertainty	B	5.0	N	1	0.6	1.7	M
	Combined Standard Uncertainty			RSS			11.25	
	Expanded Uncertainty (95% CONFIDENCE INTERVAL)			K=2			22.5	

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## 10 MAIN TEST INSTRUMENTS

**Table 9: List of Main Instruments**

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	HP 8753E	US38433212	August 29, 2005	One year
02	Dielectric Probe Kit	Agilent 85070C	US99360113	No Calibration Requested	
03	Power meter	NRVD	101253	No Calibration Requested	
04	Power sensor	NRV-Z5	100331		
05	Power sensor	NRV-Z6	100011		
06	Signal Generator	MG 3633A	M73386	No Calibration Requested	
07	Amplifier	AT 50S1G4A	26549	No Calibration Requested	
08	BTS	CMU 200	105948	August 15, 2005	One year
09	E-field Probe	SPEAG ET3DV6	1736	November 25, 2005	One year
10	DAE	SPEAG DAE3	536	July 11, 2005	One year

## 11 TEST PERIOD

The test is performed from June 14<sup>th</sup>, 2006 to June 15<sup>th</sup>, 2006.

## 12 TEST LOCATION

The test is performed at Radio Communication & Electromagnetic Compatibility Laboratory of Telecommunication Metrology Center

\*\*\*END OF REPORT BODY\*\*\*

## **ANNEX A MEASUREMENT PROCESS**

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the reference point was measured and was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of the phantom was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the flat phantom and the horizontal grid spacing was 10 mm x 10 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

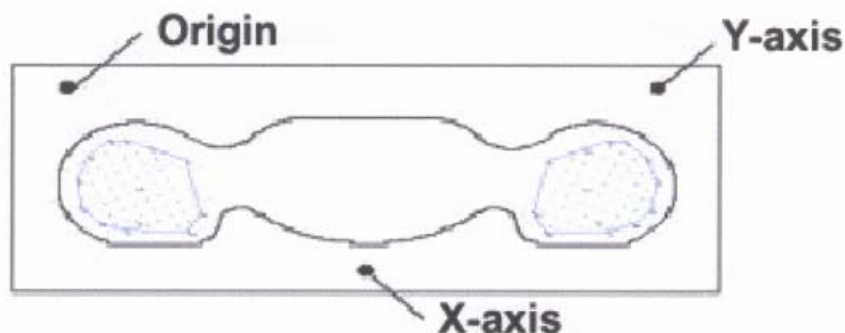
Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

b. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x ~ y and z-directions). The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

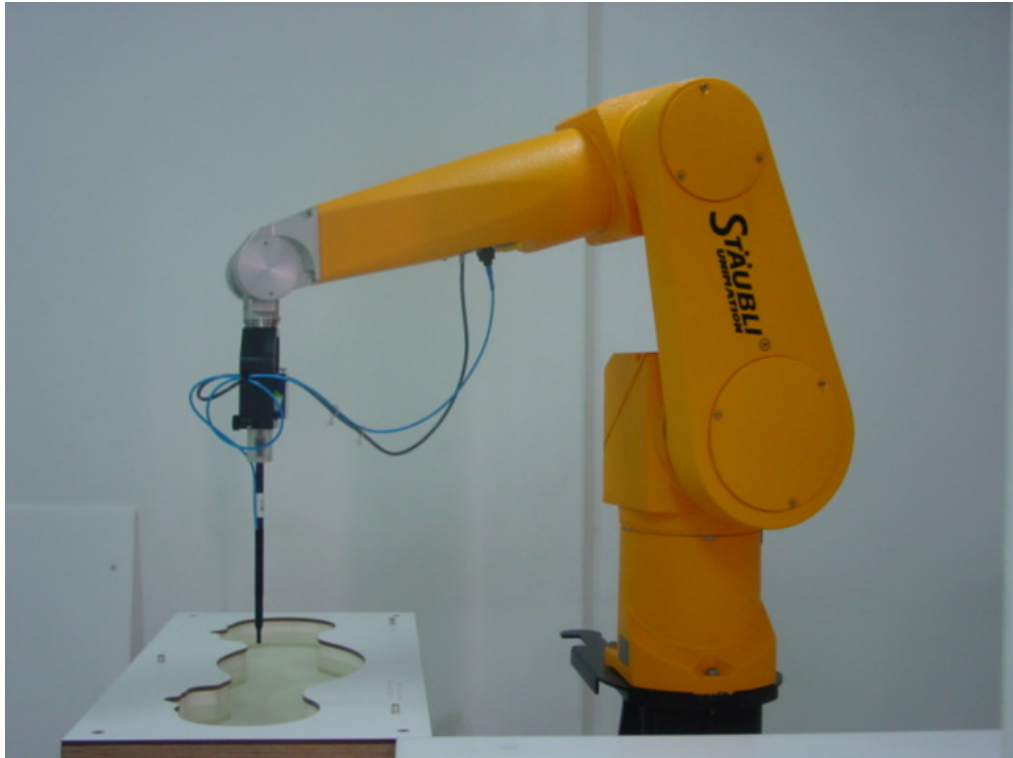
c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation is repeated.



**Picture A: SAR Measurement Points in Area Scan**

## ANNEX B TEST LAYOUT

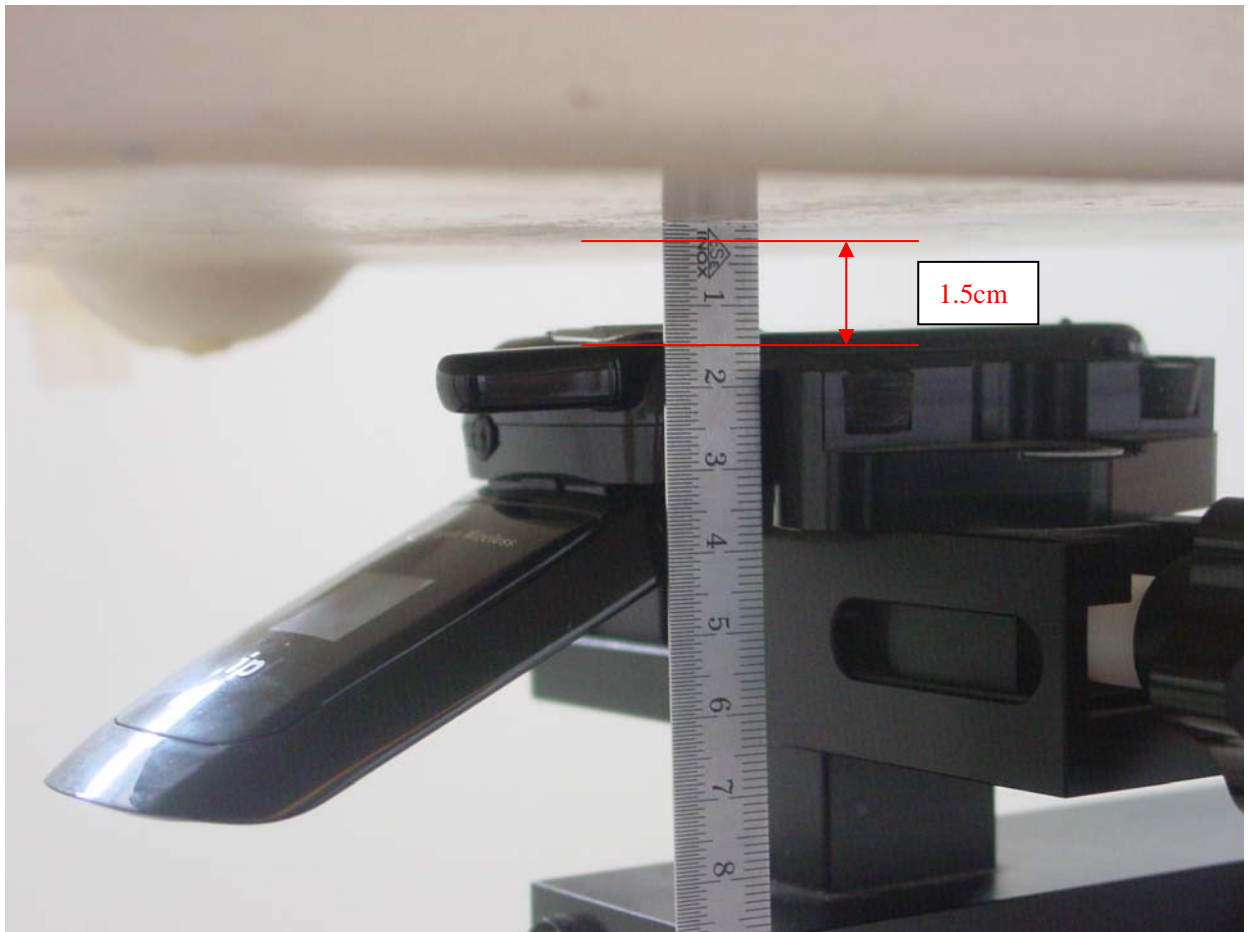


Picture B1: Specific Absorption Rate Test Layout



Picture B2: Liquid depth in the Flat Phantom (2450MHz)





**Picture B3: Body-worn Position (toward ground, the distance from handset to the bottom of the Phantom is 1.5cm)**

## ANNEX C GRAPH RESULTS

### WLAN 802.11b Toward Ground High

Electronics: DAE3 Sn536

Communication System: Wlan 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(4.35, 4.35, 4.35)

**Toward Ground High/Area Scan (71x161x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.015 mW/g

**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.15 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.041 W/kg

**SAR(1 g) = 0.001 mW/g; SAR(10 g) = 0.000107 mW/g**

Maximum value of SAR (measured) = 0.041 mW/g

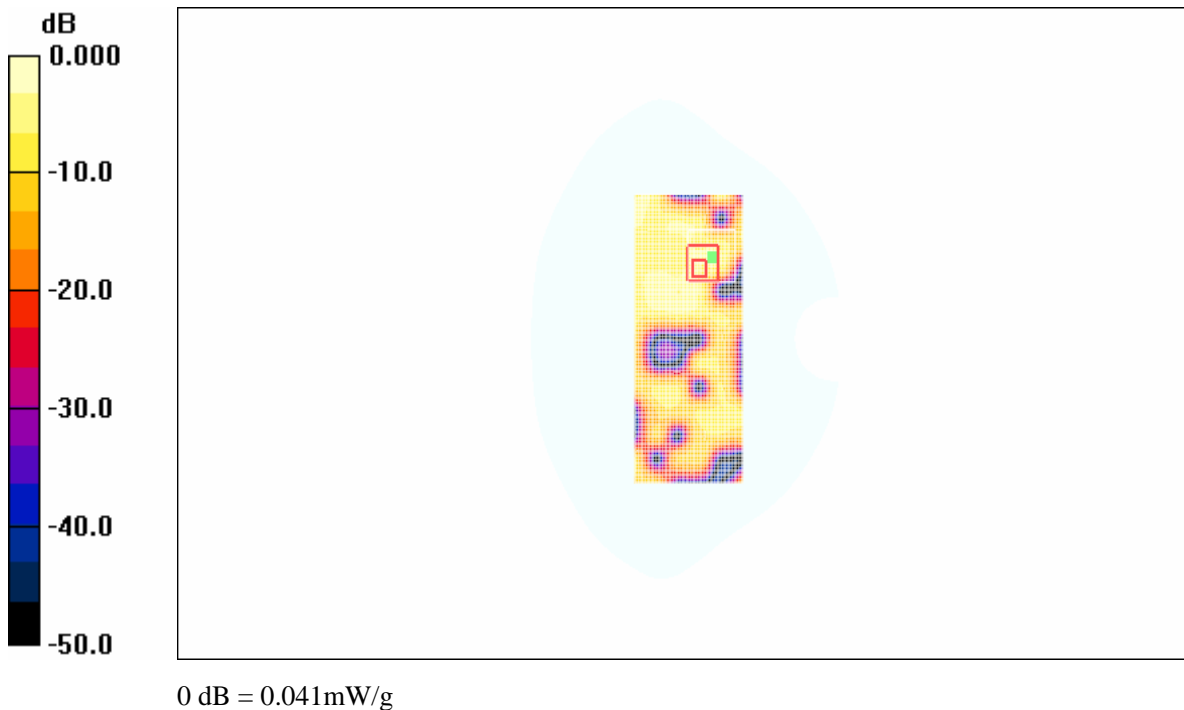


Fig. 1 Mode 802.11b Body Towards Ground 2450MHz CH11

**WLAN 802.11b Toward Ground Middle**

Electronics: DAE3 Sn536

Communication System: Wlan 2450 Frequency: 2437 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(4.35, 4.35, 4.35)

**Toward Ground Middle/Area Scan (91x181x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.014 mW/g

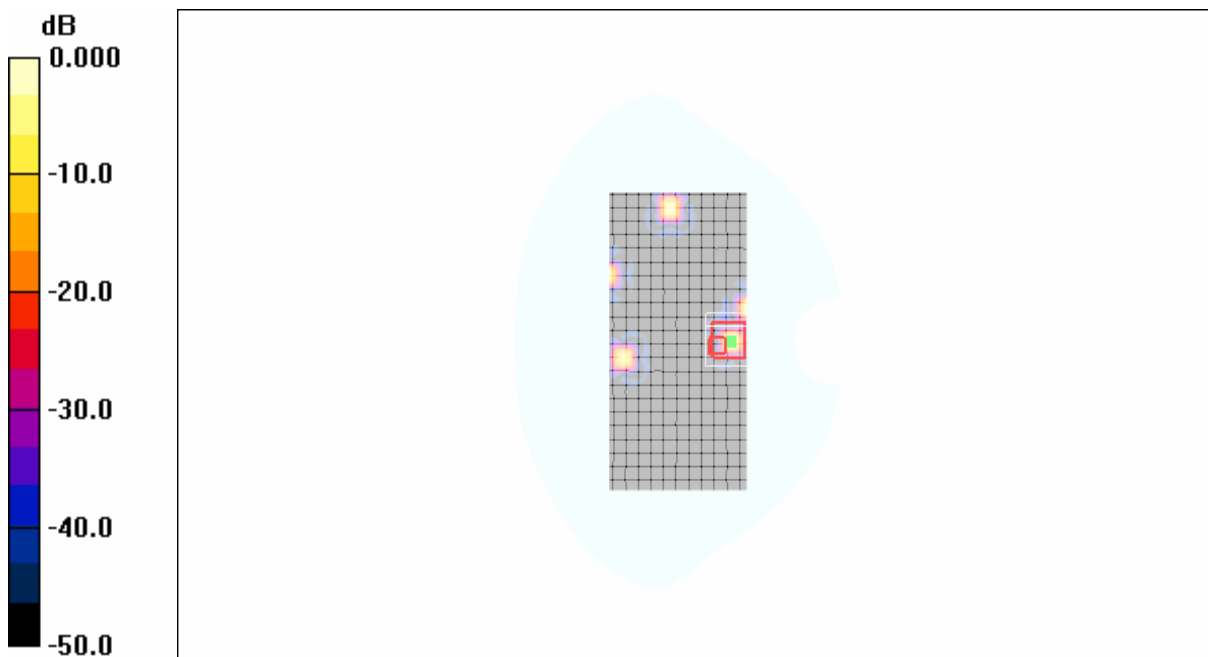
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.12 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.025 W/kg

**SAR(1 g) = 0.00157 mW/g; SAR(10 g) = 0.000364 mW/g**

Maximum value of SAR (measured) = 0.025 mW/g



0 dB = 0.025mW/g

**Fig. 2 Mode 802.11b Body Towards Ground 2450MHz CH6**

**WLAN 11b Toward Ground Low**

Electronics: DAE3 Sn536

Communication System: Wlan 2450 Frequency: 2412 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(4.35, 4.35, 4.35)

**Toward Ground Low/Area Scan (91x181x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.020 mW/g

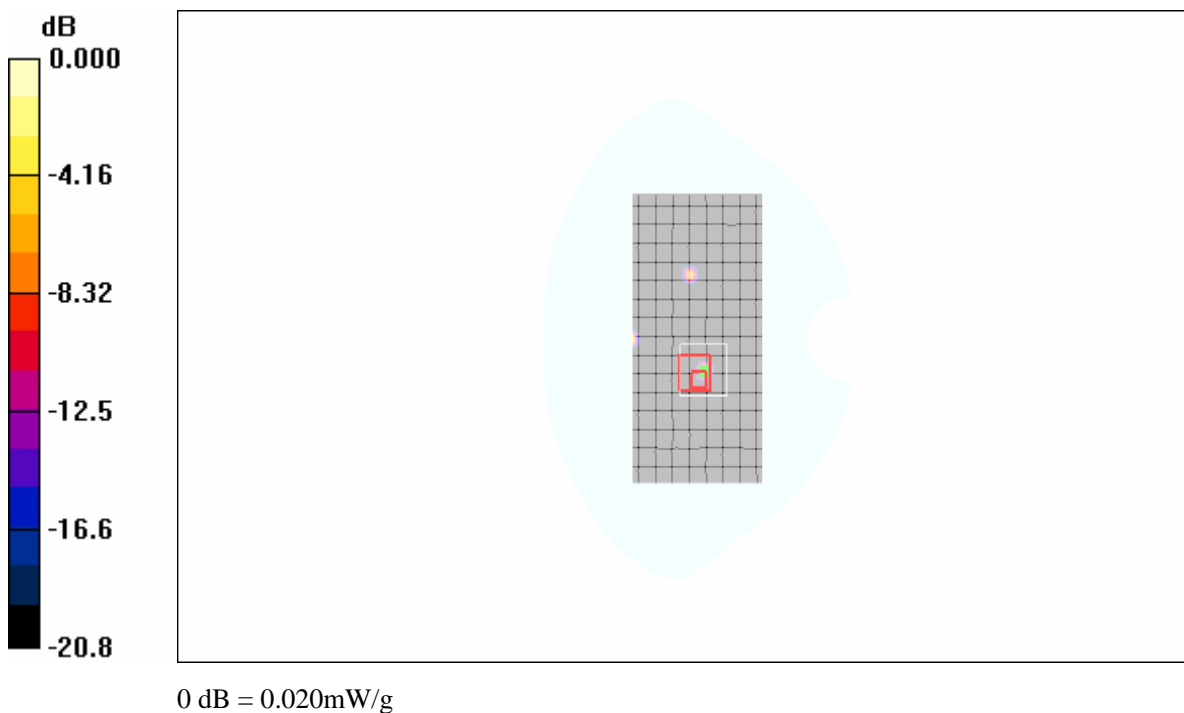
**Toward Ground Low 2/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.987 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.018 W/kg

**SAR(1 g) = 0.00298 mW/g; SAR(10 g) = 0.000451 mW/g**

Maximum value of SAR (measured) = 0.020 mW/g



**Fig. 3 Mode 802.11b Body Towards Ground 2450MHz CH1**

**WLAN 802.11g Toward Ground High**

Electronics: DAE3 Sn536

Communication System: WLan 2450 Frequency: 2462 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(4.35, 4.35, 4.35)

**Toward Ground High/Area Scan (71x161x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.005 mW/g

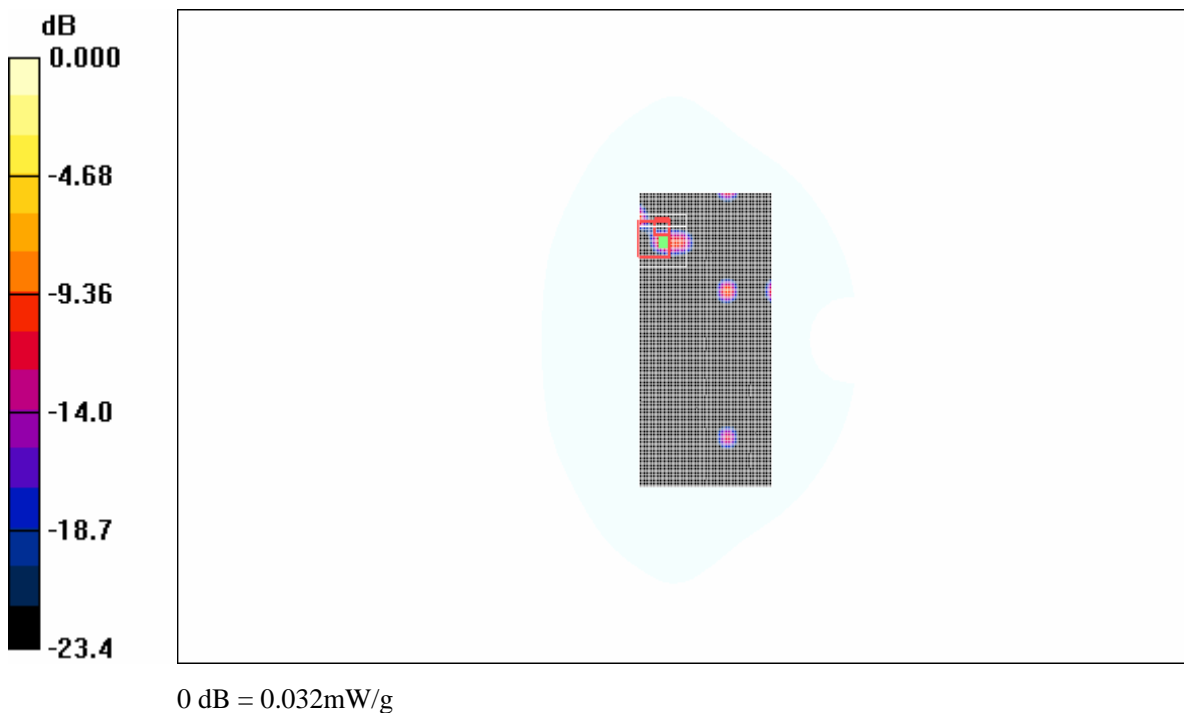
**Toward Ground High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.685 V/m; Power Drift = 0.200 dB

Peak SAR (extrapolated) = 0.032 W/kg

**SAR(1 g) = 0.00107 mW/g; SAR(10 g) = 0.000149 mW/g**

Maximum value of SAR (measured) = 0.032 mW/g



**Fig. 4 Mode 802.11g Body Towards Ground 2450MHz CH11**

**WLAN 802.11g Toward Ground Middle**

Electronics: DAE3 Sn536

Communication System: Wlan 2450 Frequency: 2437 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(4.35, 4.35, 4.35)

**Toward Ground Middle/Area Scan (91x181x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.008 mW/g

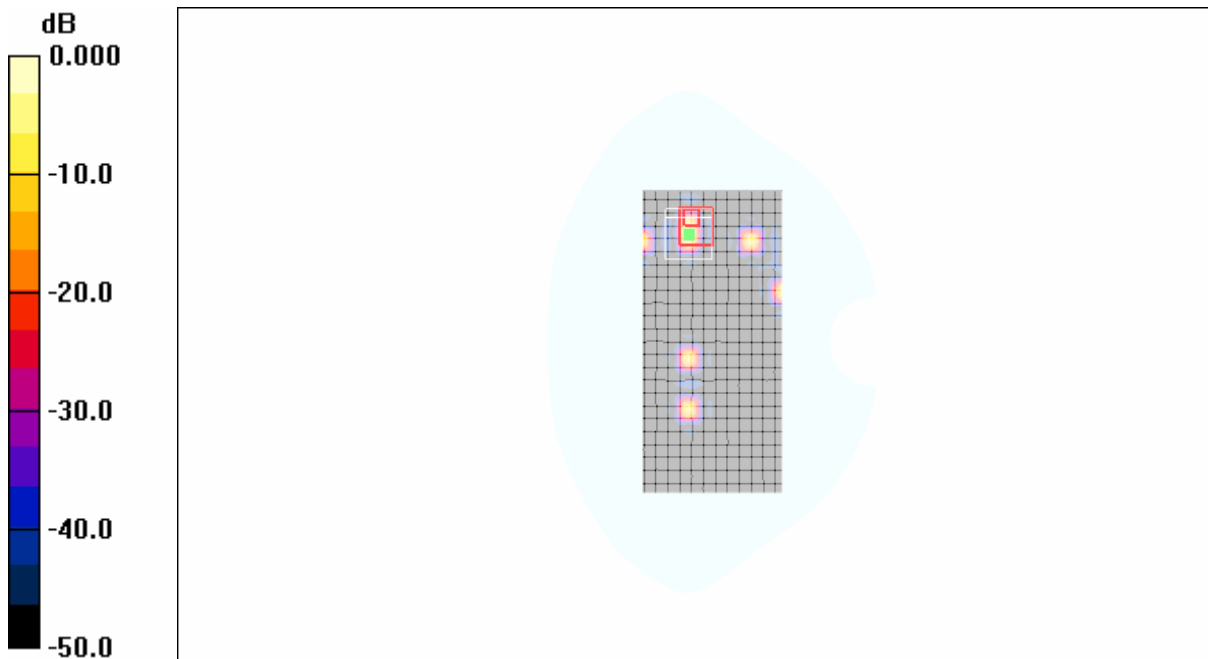
**Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.13 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.034 W/kg

**SAR(1 g) = 0.0024 mW/g; SAR(10 g) = 0.000283 mW/g**

Maximum value of SAR (measured) = 0.034 mW/g



0 dB = 0.034mW/g

**Fig. 5 Mode 802.11g Body Towards Ground 2450MHz CH6**

**WLAN 802.11g Toward Ground Low**

Electronics: DAE3 Sn536

Communication System: WLan 2450 Frequency: 2412 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(4.35, 4.35, 4.35)

**Toward Ground Low/Area Scan (91x181x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.011 mW/g

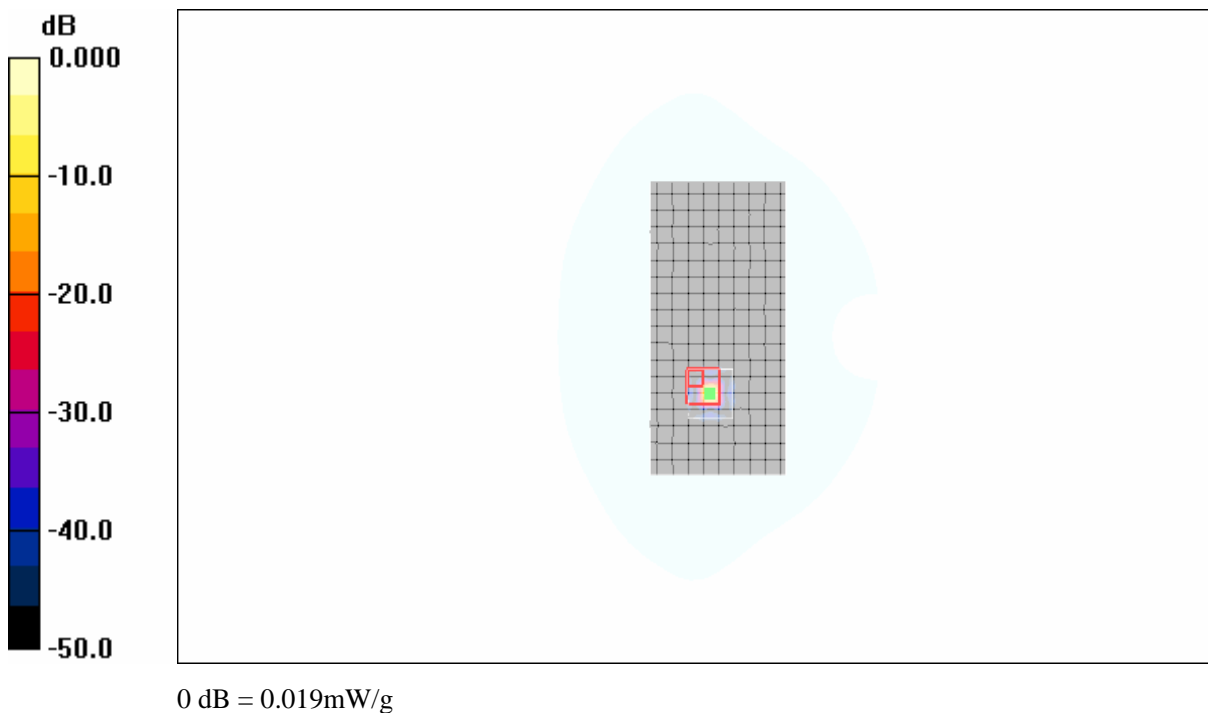
**Toward Ground Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.809 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.019 W/kg

**SAR(1 g) = 0.000571 mW/g; SAR(10 g) = 0.000153 mW/g**

Maximum value of SAR (measured) = 0.019 mW/g



**Fig. 6 Mode 802.11g Body Towards Ground 2450MHz CH1**

**Telecommunication Metrology Center  
of Ministry of Information Industry**

No. SAR2006005-1

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**ANNEX D PROBE CALIBRATION CERTIFICATE**

**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TMC-Auden**

Certificate No: **ET3-1736\_Nov05**

**CALIBRATION CERTIFICATE**

Object **ET3DV6 - SN:1736**

Calibration procedure(s) **QA CAL-01.v5  
Calibration procedure for dosimetric E-field probes**

Calibration date: **November 25, 2005**

Condition of the calibrated item **In Tolerance**


This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.


All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference Probe ES3DV2	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
DAE4	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
Reference Probe ES3DV2	SN: 907	21-Jun-05 (SPEAG, No. DAE4-907_Jun05)	Jun-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

Calibrated by:	Name <b>Nico Vetterli</b>	Function <b>Laboratory Technician</b>	Signature 
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Approved by:	<b>Katja Pokovic</b>	<b>Technical Manager</b>	
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Issued: November 25, 2005

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Calibration Laboratory of  
Schmid & Partner  
Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland



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The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

**Methods Applied and Interpretation of Parameters:**

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* frequency\_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>:** DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 SN:1736

November 25, 2005

Probe ET3DV6

SN:1736

Manufactured:	September 27, 2002
Last calibrated:	July 14, 2005
Recalibrated:	November 25, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1736

November 25, 2005

### DASY - Parameters of Probe: ET3DV6 SN:1736

#### Sensitivity in Free Space<sup>A</sup>

#### Diode Compression<sup>B</sup>

NormX	1.97 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	93 mV
NormY	1.75 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	93 mV
NormZ	1.97 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	93 mV

#### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

#### Boundary Effect

TSL                      900 MHz      Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	9.6	5.0
SAR <sub>be</sub> [%]	With Correction Algorithm	0.1	0.3

TSL                      1810 MHz      Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	13.2	8.8
SAR <sub>be</sub> [%]	With Correction Algorithm	0.6	0.1

#### Sensor Offset

Probe Tip to Sensor Center                      2.7 mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

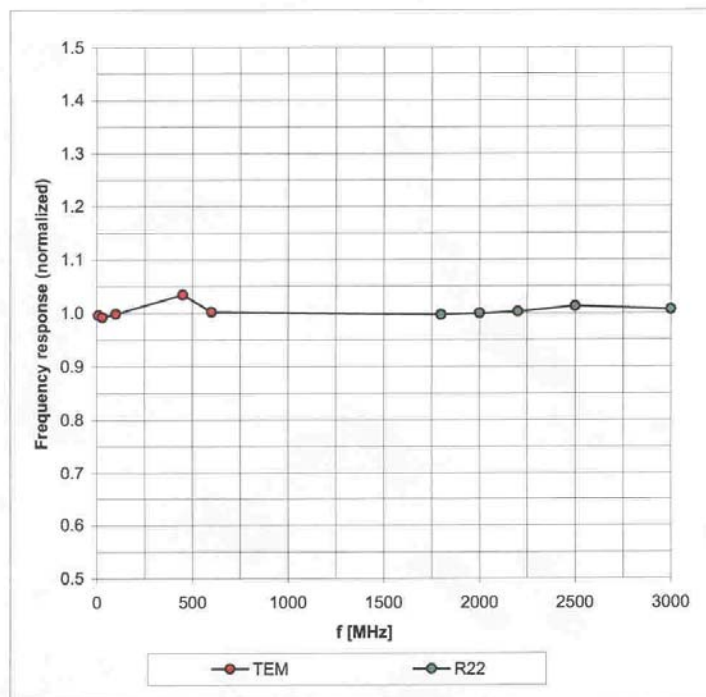
<sup>B</sup> Numerical linearization parameter: uncertainty not required.

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### Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

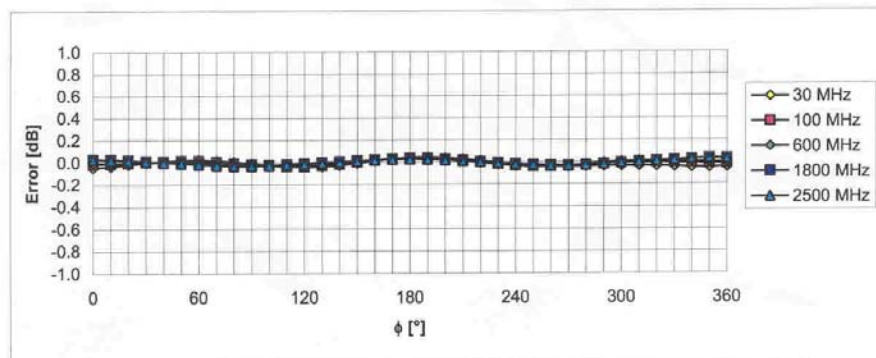
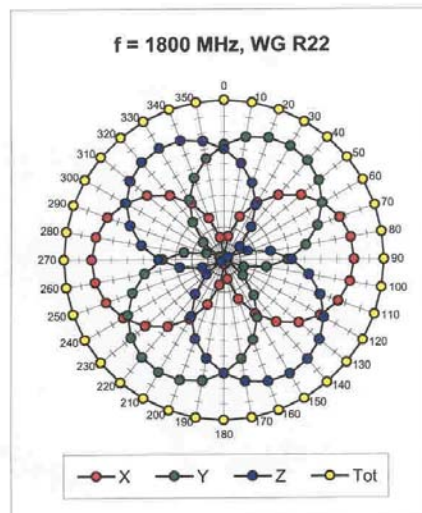
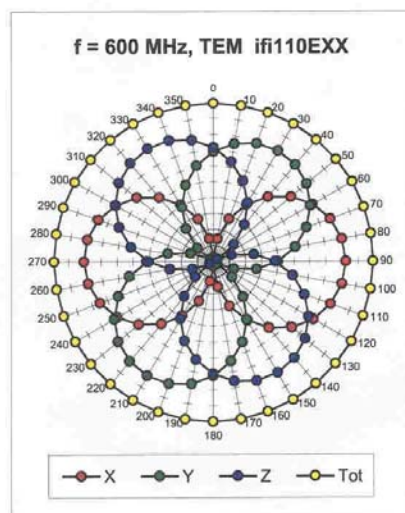


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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November 25, 2005

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$

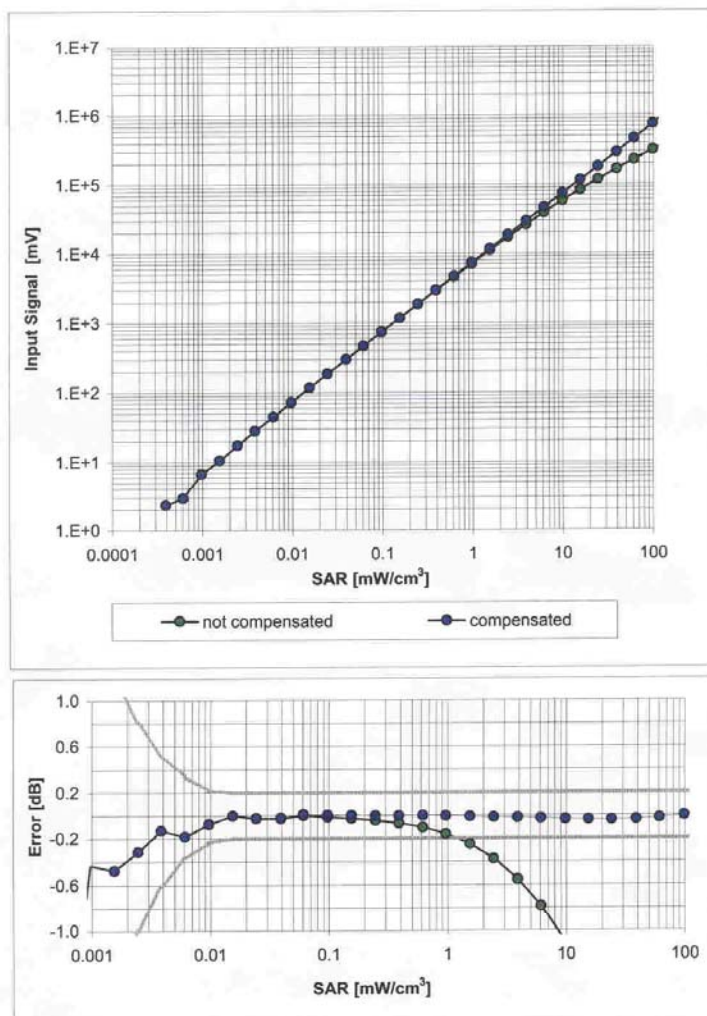


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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

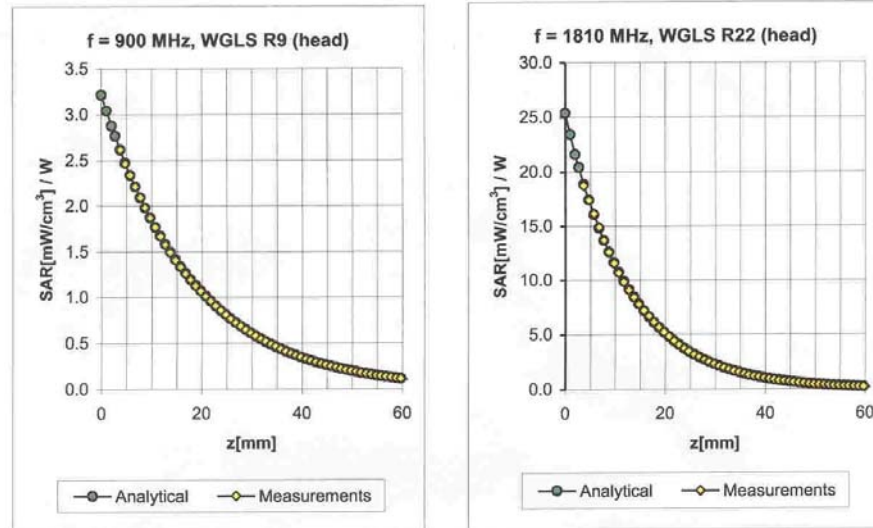


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

ET3DV6 SN:1736

November 25, 2005

### Conversion Factor Assessment



f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.56	1.85	6.51 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.47	5.40 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.62	2.29	4.67 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.12	1.61	7.74 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.47	2.15	6.45 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.53	2.78	4.88 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.65	2.11	4.35 ± 11.8% (k=2)

<sup>c</sup> 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.

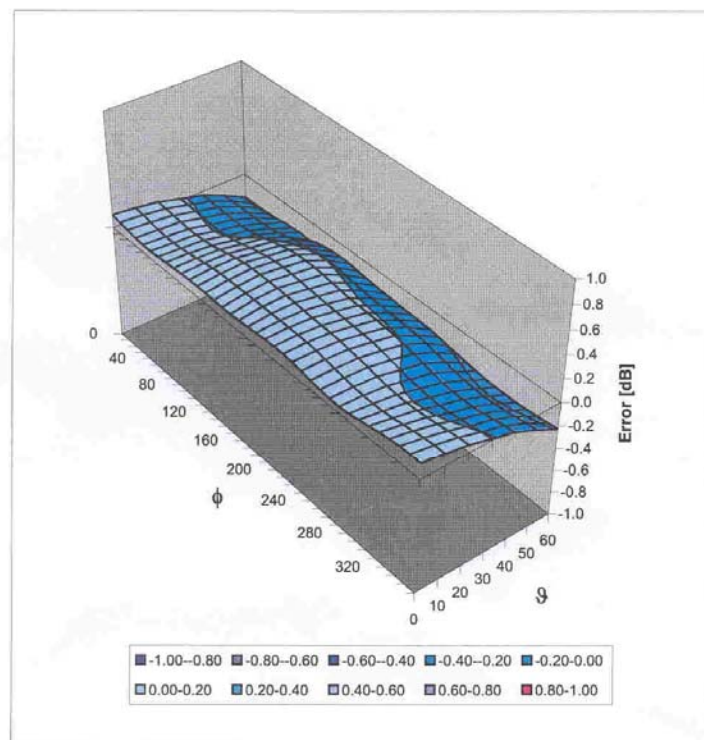


ET3DV6 SN:1736

November 25, 2005

### Deviation from Isotropy in HSL

Error ( $\phi$ ,  $\vartheta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )