ITS Intertek Testing Services
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Specific Absorption Rate (SAR) Test Report
for
Tellus Technology.
on the
CDPD Modem for PDA
Model: WipClip-V131C(W)

Test Report: 20515211
Date of Report: June 7, 2001

Job #: J20051521
Date of Test: May 25 to June 2, 2001

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Accredited for testing to FCC Parts 15

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Review Date: 6/12/01

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1.0 JOB DESCRIPTION

1.1 Client Information

The WipClip-V131Chas been tested at the request of

Company: Tellus Technology
6140 Stevenson Blvd.
Fremont, CA 94538
USA

Name of contact: Mr. Ray Baker
Telephone: (510) 498-8500 X150
Fax ((510) 580-1600

1.2 Equipment under test (EUT)

Product Descriptions:

Equipment	CDPD Modem for PDA		
Trade Name	Tellus Technology	P/N.	WIPClipV131C
FCC ID	NZ6V8131C	S/N No.	Not Labeled
Category	Portable, Handheld	RF Exposure	Uncontrolled Environment
Frequency Band	824 -849 MHz	System	CDPD Modem

EUT Antenna Description			
Type	Dipole	Configuration	360^{o} Rotation
Dimensions	30mm (L)	Gain	0 dBi
Location	On top-right side		

Use of Product : The Tellus WIPClip™ CDPD Springboard™ module is a CDPD (Cellular Digital Packet Data) wireless data modem designed for Handspring™ Visor™ PDA (Personal Digital Assistant). The WIPClip easily snaps into the Springboard expansion slot with a 64-pin connector.

Manufacturer: SAME as above.

Production is planned: [X] Yes, [ ] No

EUT receive date: May 24, 2001

EUT received condition: Good working condition prototype

Test start date: May 25

Test end date: June 2, 2001

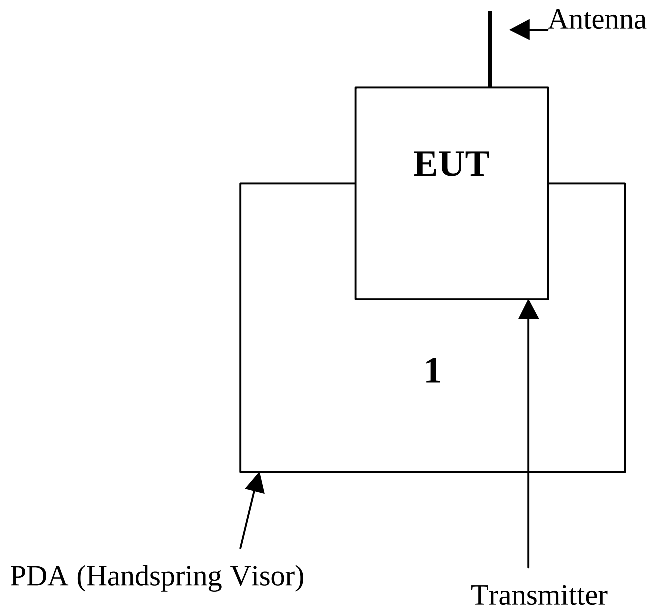
1.3 Test plan reference

FCC rule part 2.1093, FCC Docket 96-326 & Supplement C to OET Bulletin 65

1.4 System test configuration

1.4.1 System block diagram & Support equipment

Support Equipment			
Item #	**Equipment**	**Model No.**	**Serial No.**
1	Handspring PDA	Visor	N/A



S:	Shielded	**U:**	Unshielded	**m:**	meters

1.4.2 Test Position

Configuration A

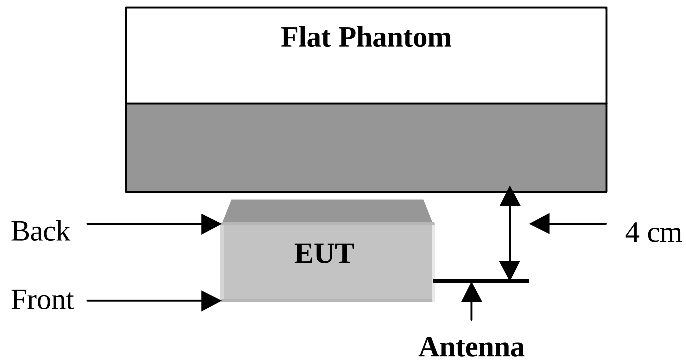


**Figure 1: EUT Back Side towards phantom,
Antenna in the straight position at 4 cm distance to phantom**

Configuration A-1

Same as *Configuration A* but body of PDA is 4 cm distance to phantom instead of antenna

Configuration B

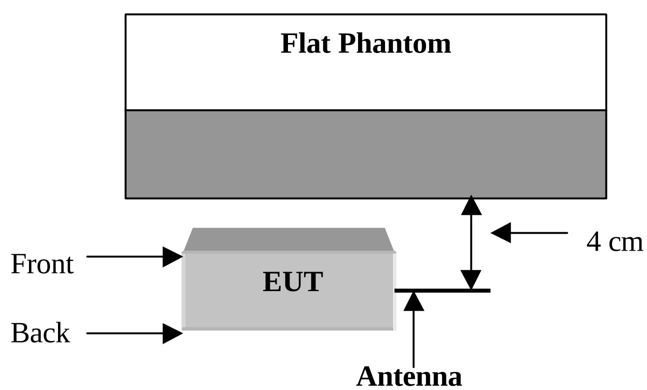


**Figure 2: EUT Front Side (Face) towards phantom,
Antenna in the straight position at 4 cm distance to phantom**

Configuration C

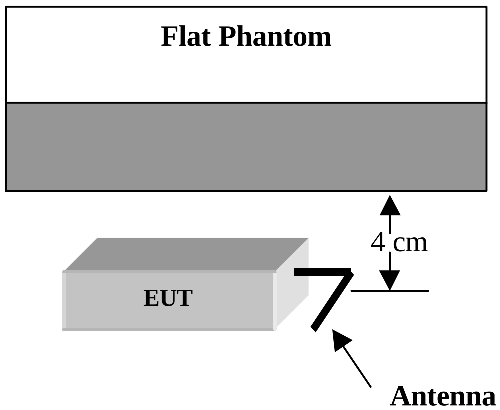


Figure 3: EUT Front Side (Face) towards phantom,
Antenna in the right angle position at 4 cm distance to phantom

Configuration D

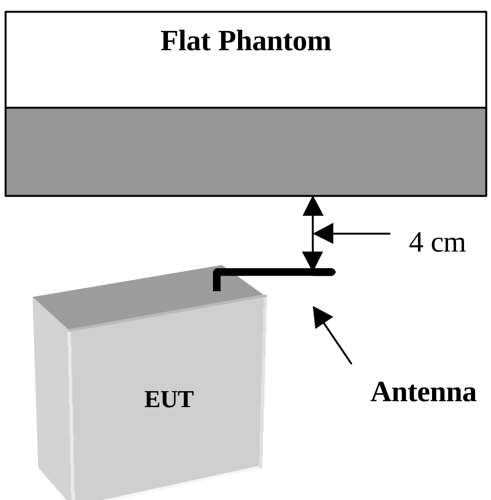


Figure 4: EUT Vertical (Top) towards phantom,
Antenna in the right angle position at 4 cm distance to phantom

1.4.3 Test Condition

During tests the worst case data (max RF coupling) was determined with following conditions:

EUT Antenna	Fixed length	Orientation	Configuration A
Usage	Handheld Device Operates with a PDA	Distance between antenna axis at the joint and the liquid surface:	4mm
Simulating human Body/hand	Yes	EUT Battery	Unit powered from External Power supply.
Power output	26.0 dBm (ERP), 28dBm (EIRP)		

See report section 1.4.2 for the configuration details of the EUT Position

The spatial peak SAR values were accessed for lowest, middle and highest operating channels, defined by the manufacturer.

Radiated power measurements were performed by the customer.

1.5 Modifications required for compliance

Intertek Testing Services implemented no modifications.

1.6 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.0 SAR EVALUATION

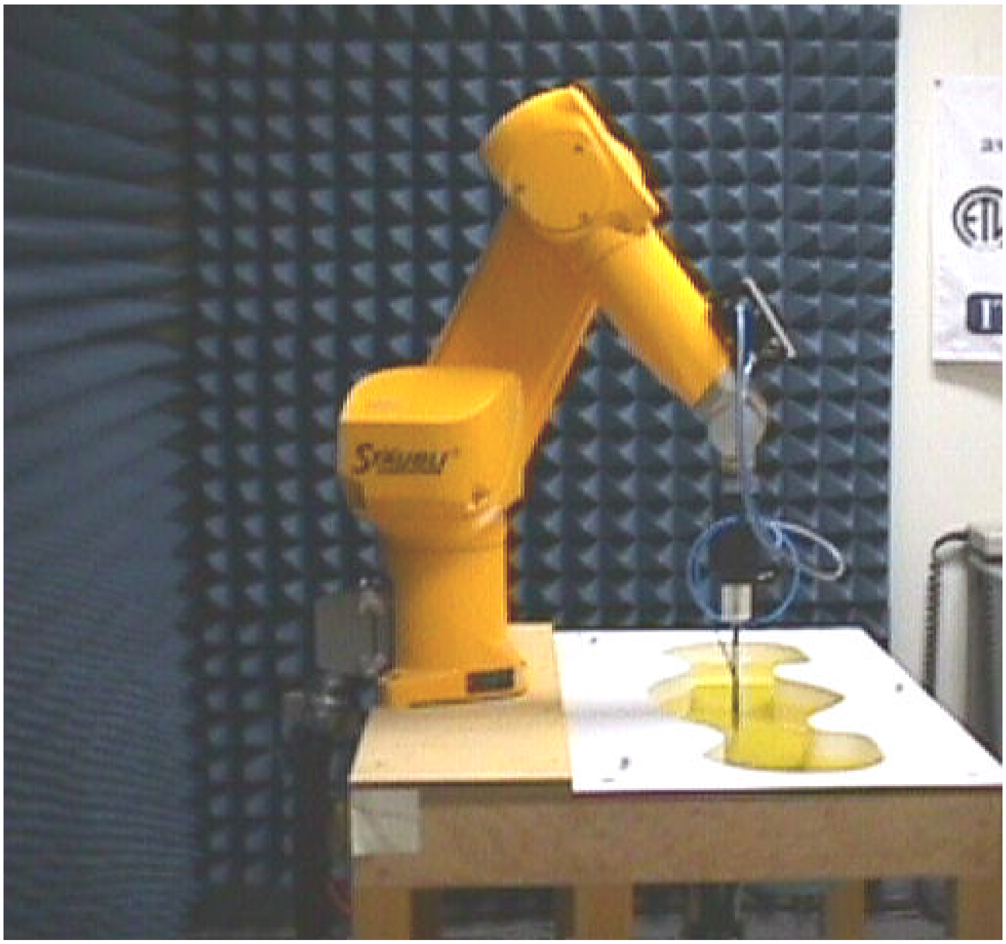
2.1 SAR Limits

The following FCC limits for SAR apply to devices operate in General Population/Uncontrolled Exposure environment:

EXPOSURE (General Population/Uncontrolled Exposure environment)	**SAR (W/kg)**
Average over the whole body	0.08
Spatial Peak (1g)	1.60
Spatial Peak for hands, wrists, feet and ankles (10g)	4.00

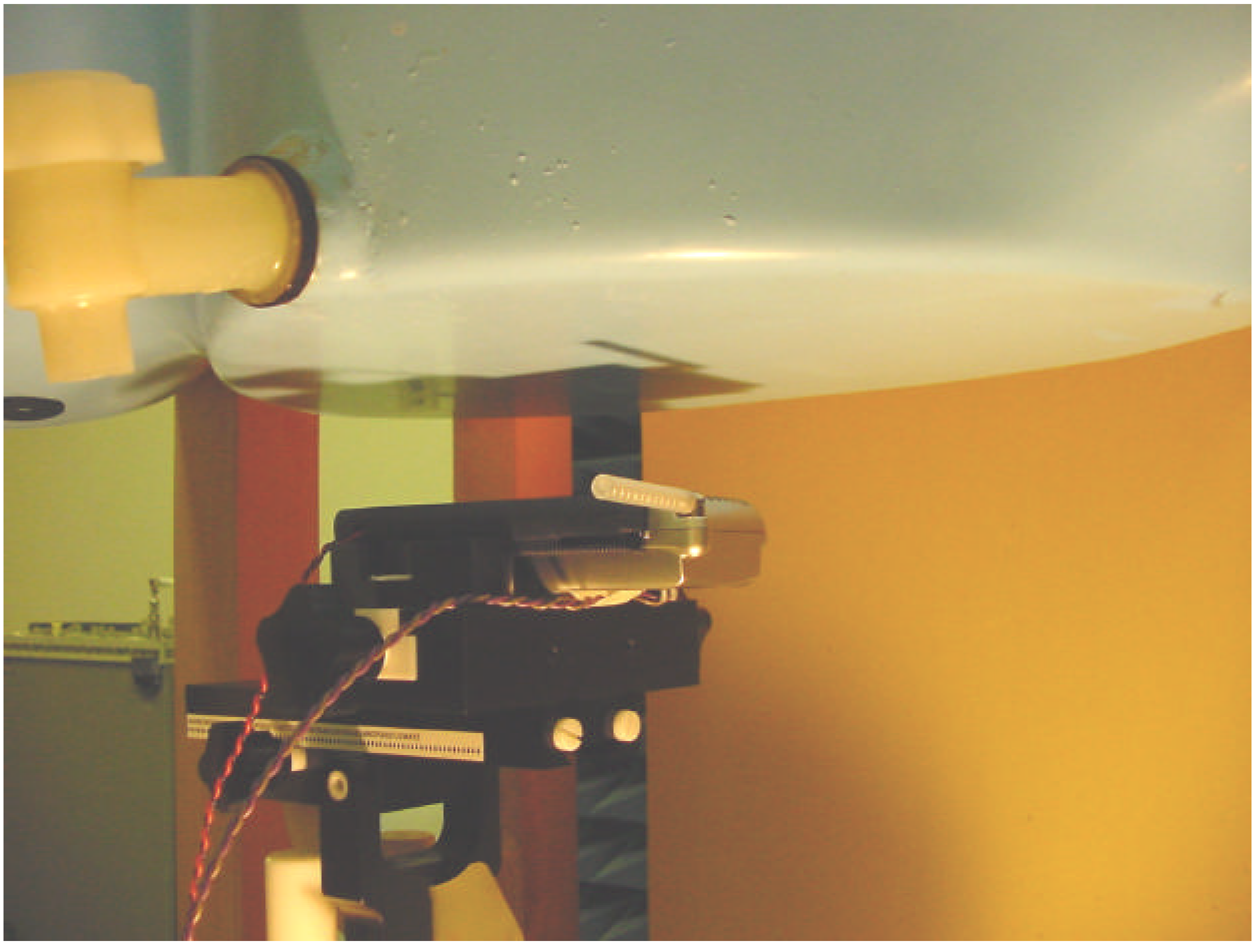
2.2 Configuration Photographs

SAR Measurement Test Setup



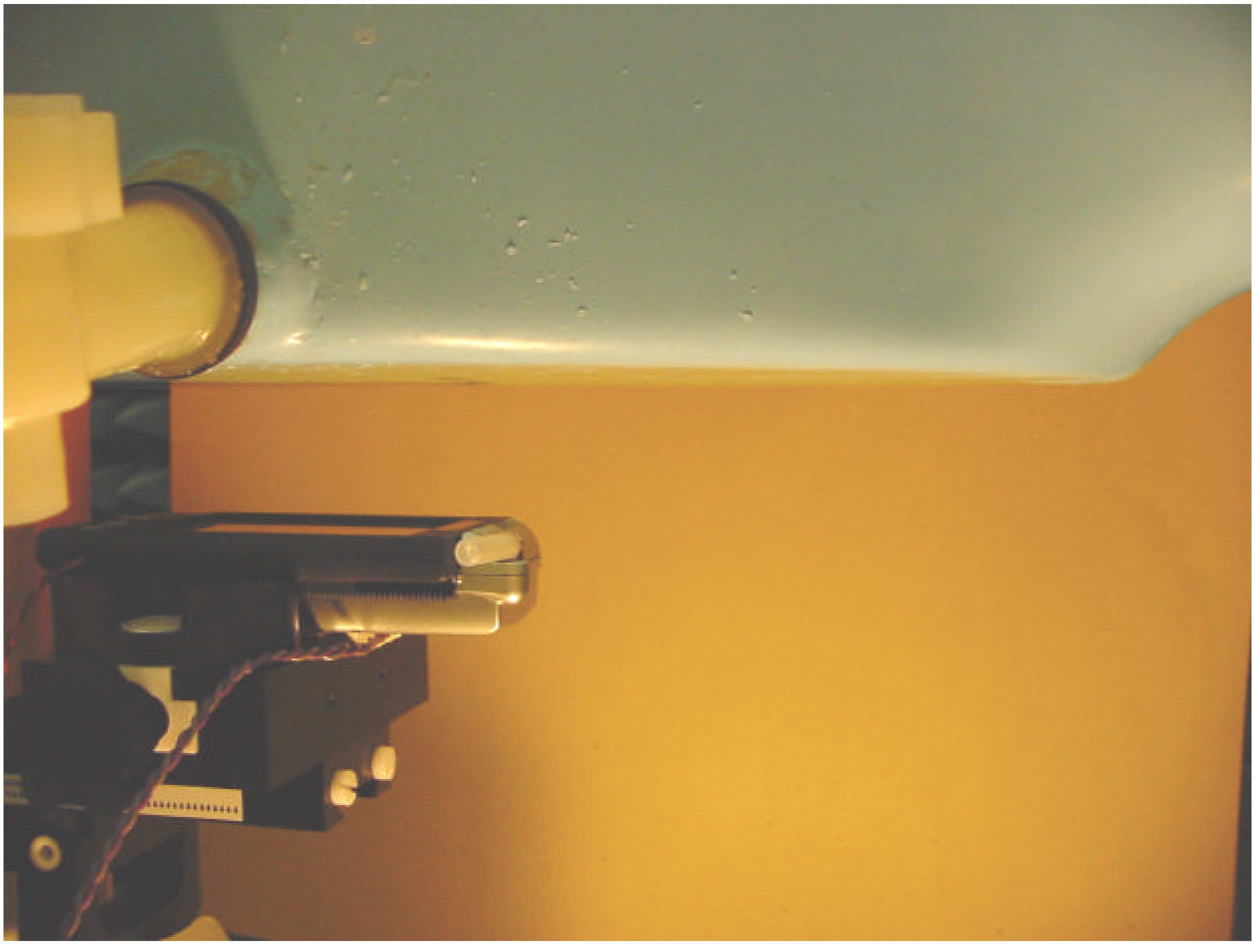
2.2 Configuration Photographs (Continued)

SAR Measurement Test Setup



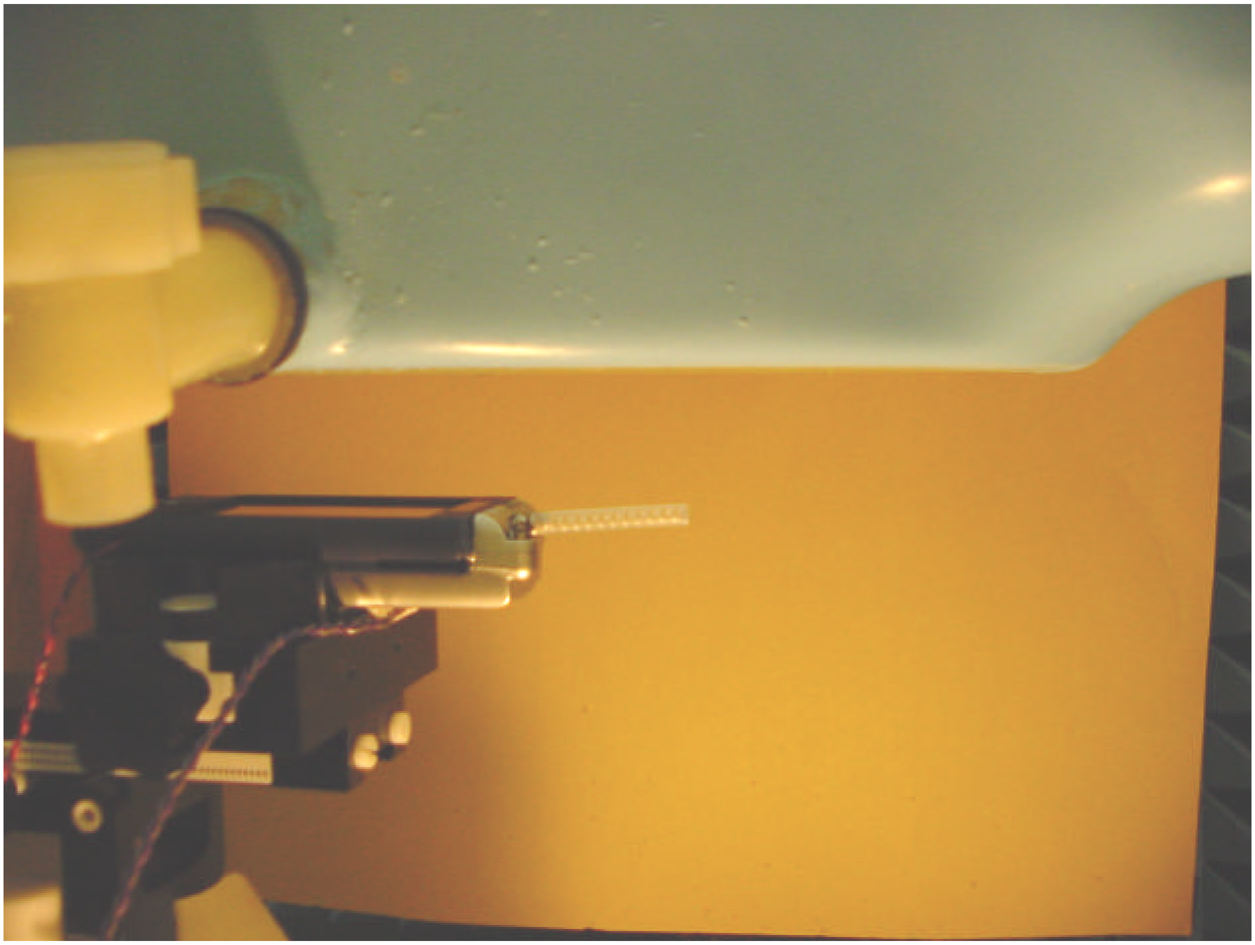
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



2.2 Configuration Photographs (Continued)

SAR measurement Test Setup

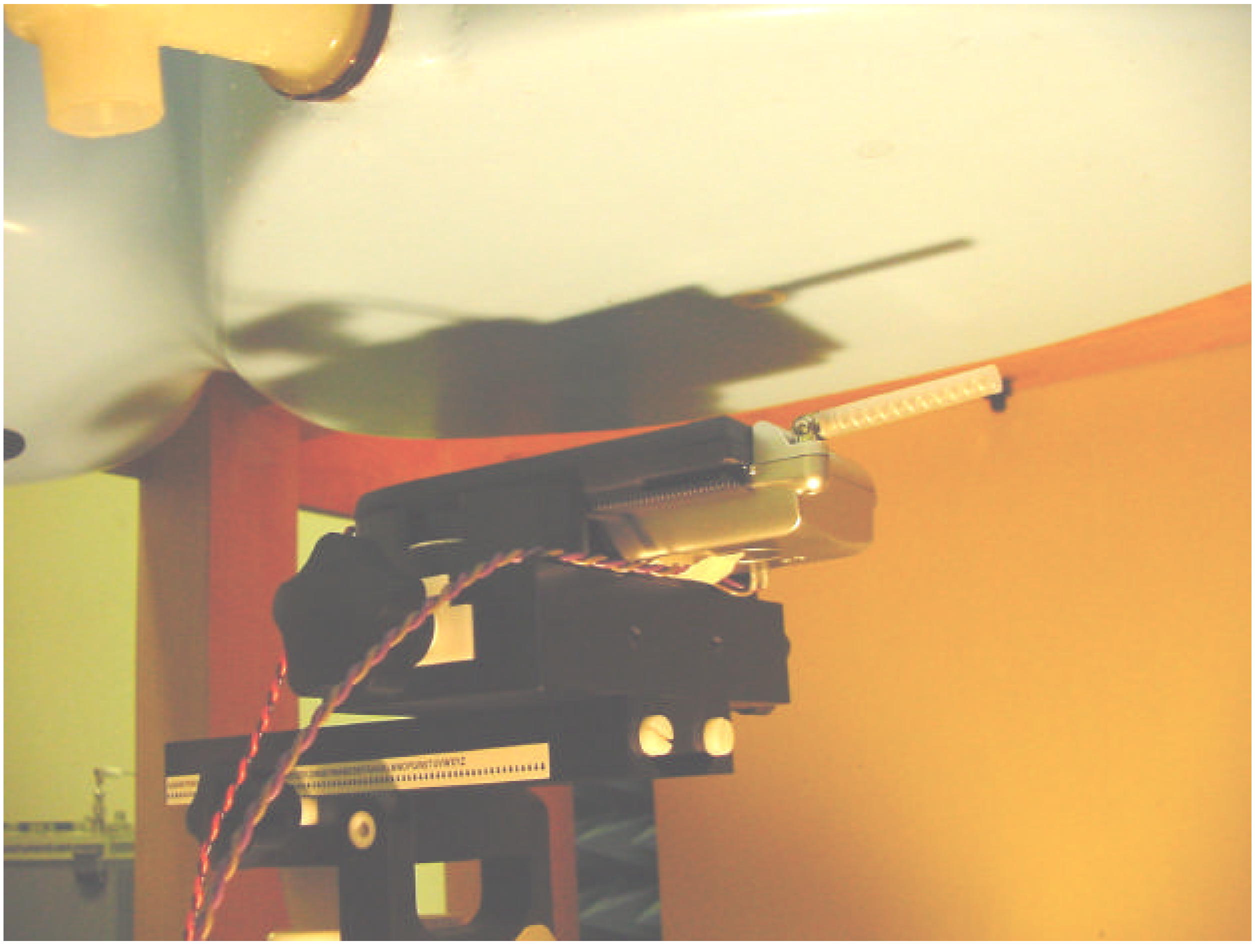


2.2 Configuration Photographs (Continued)

SAR measurement Test Setup

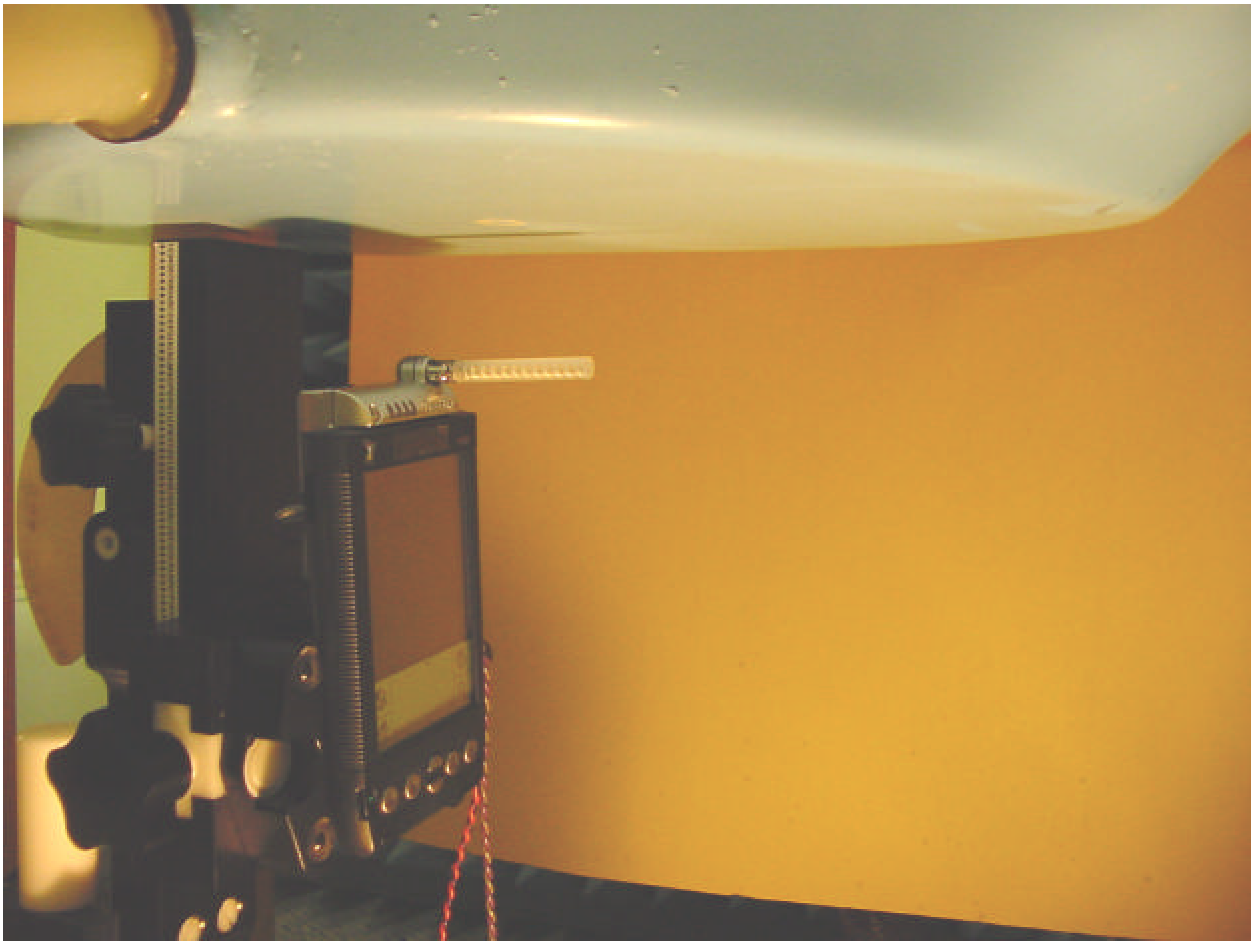
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



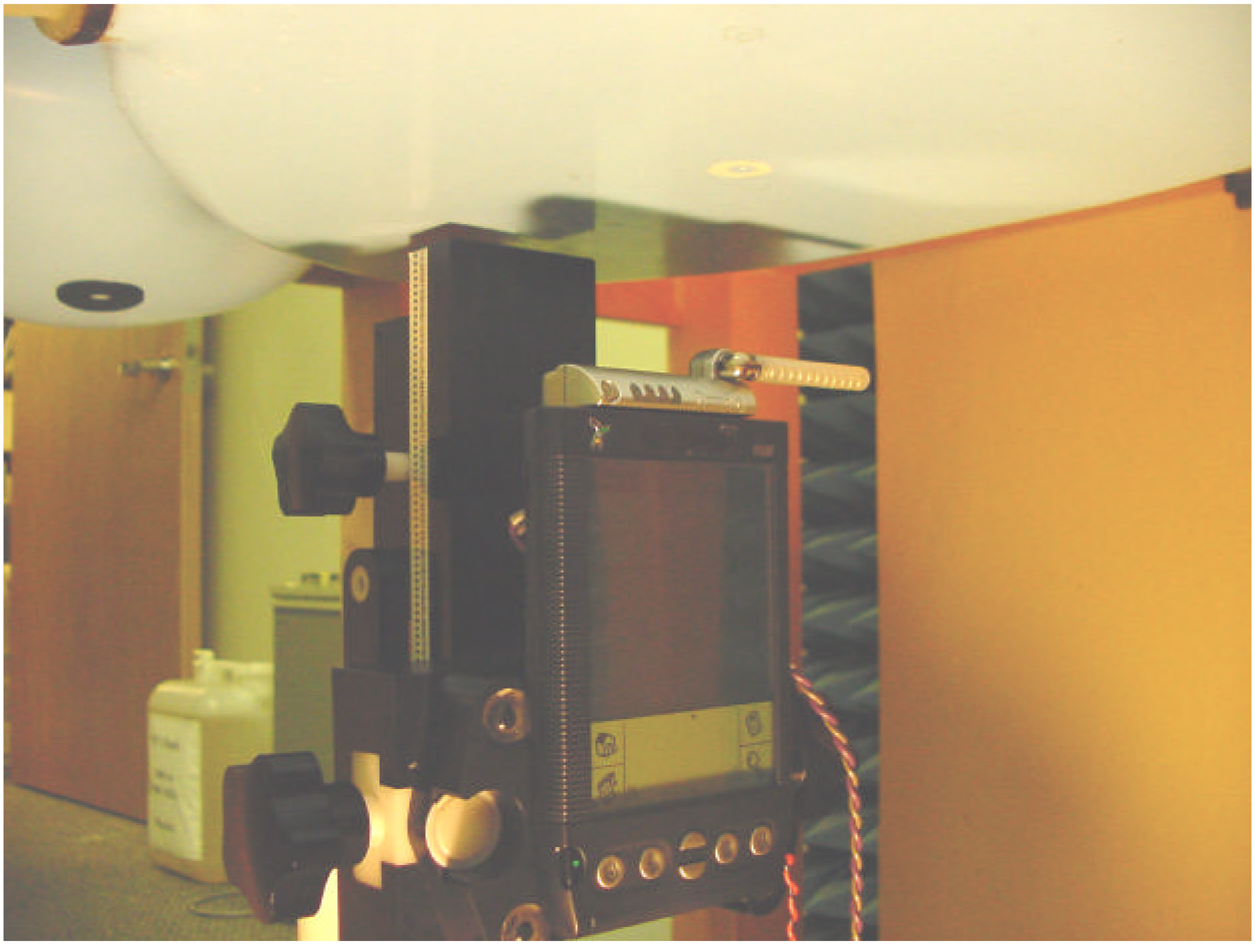
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



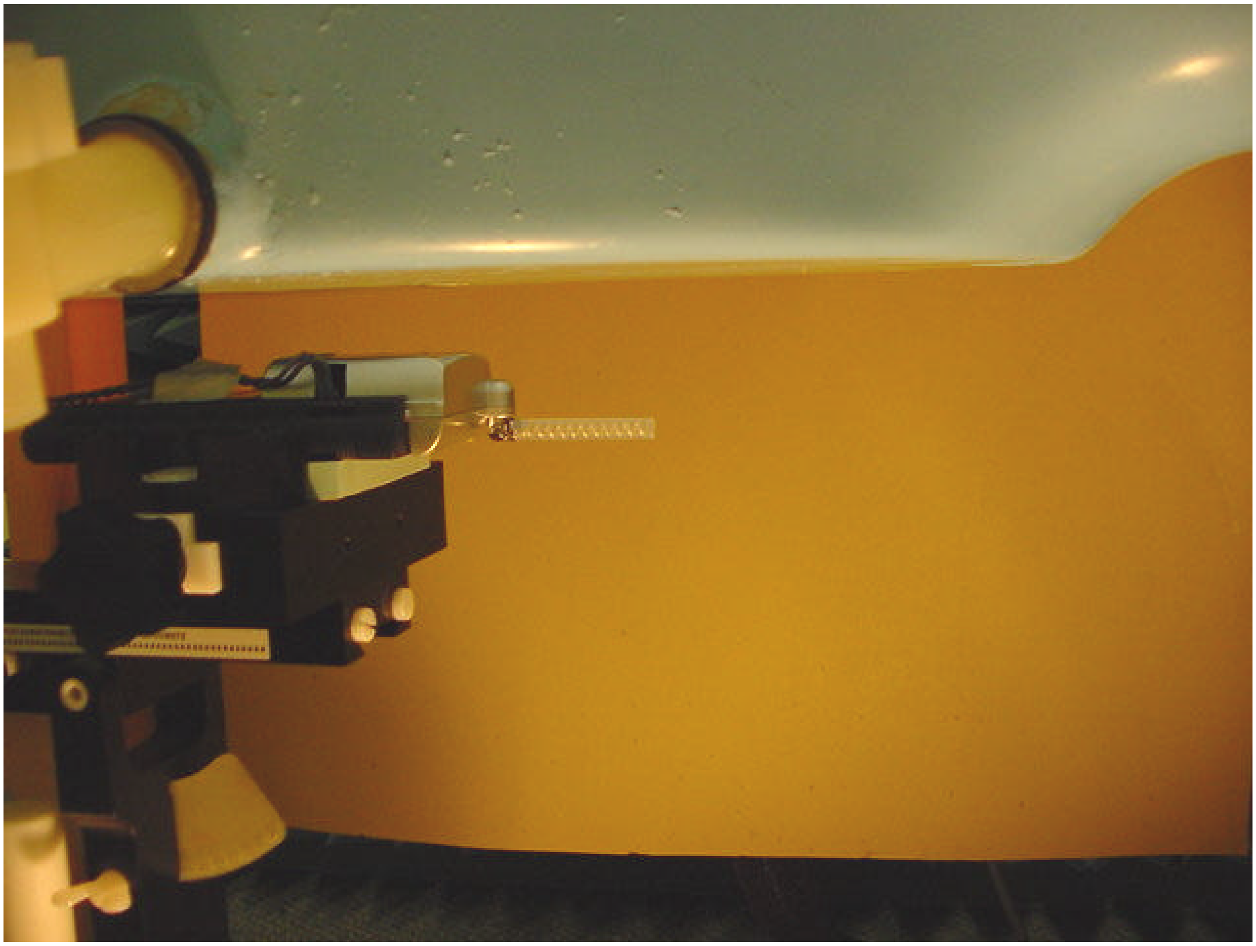
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



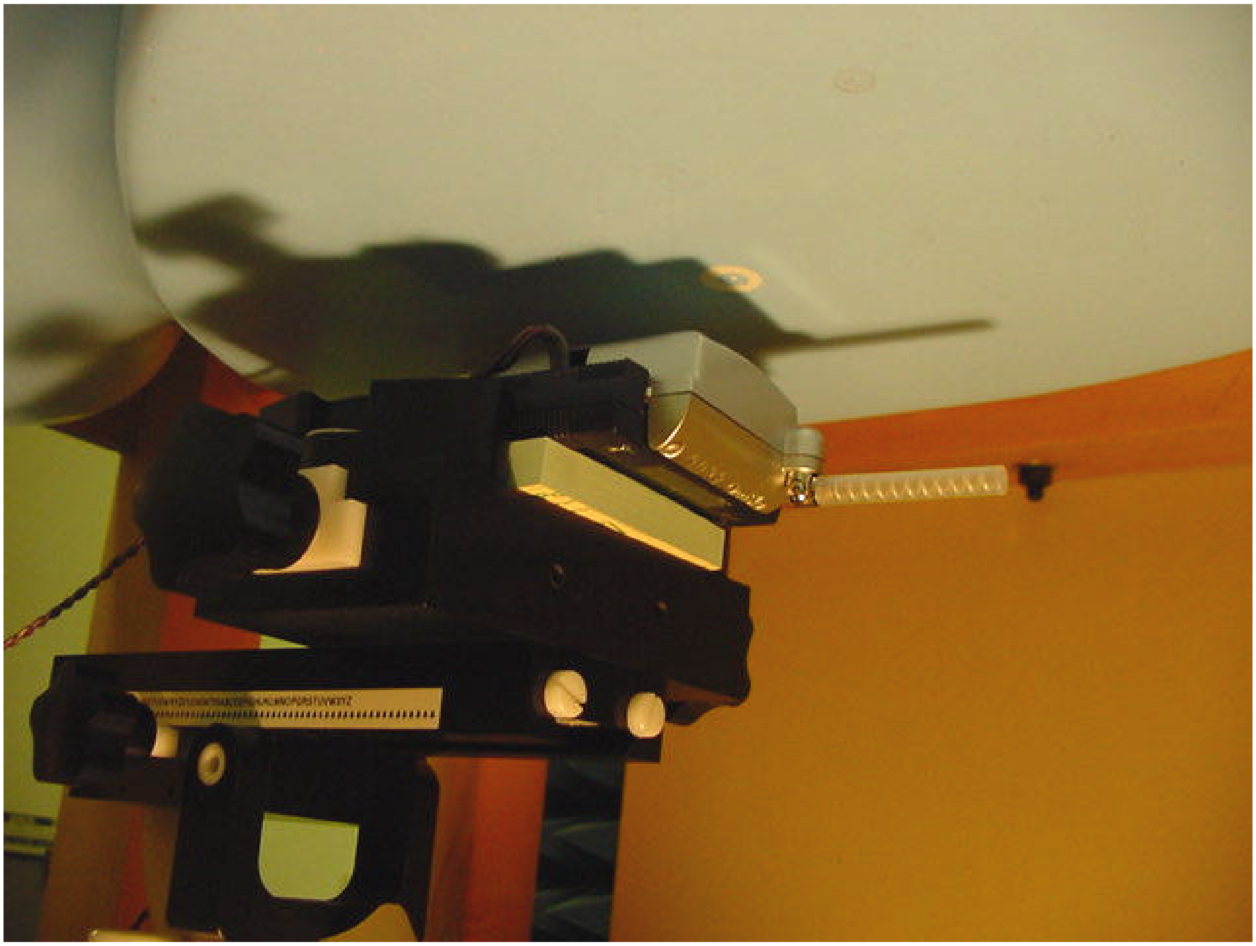
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



2.2 Configuration Photographs (Continued)

SAR measurement Test Setup

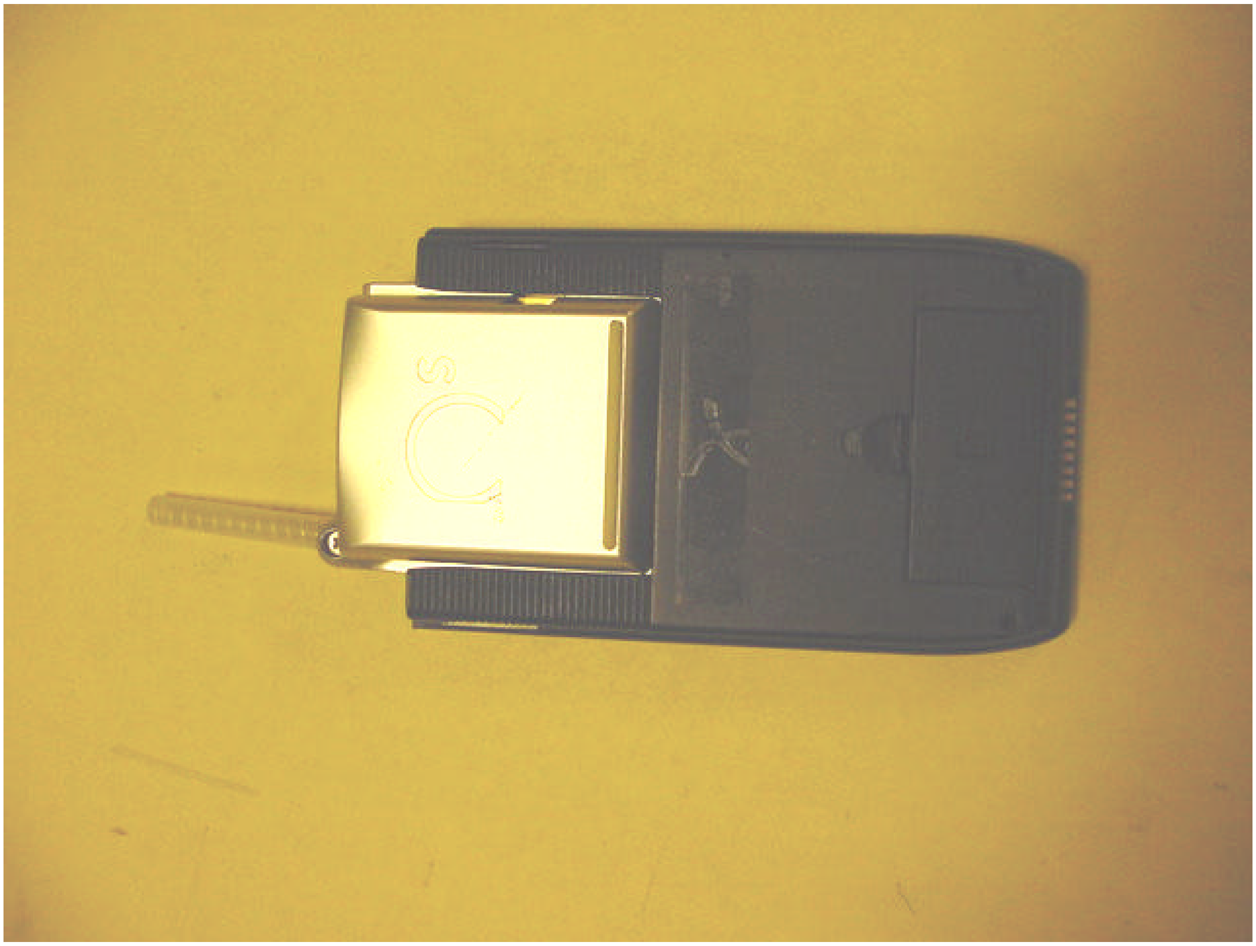


2.2 Configuration Photographs (Continued)

EUT Photo

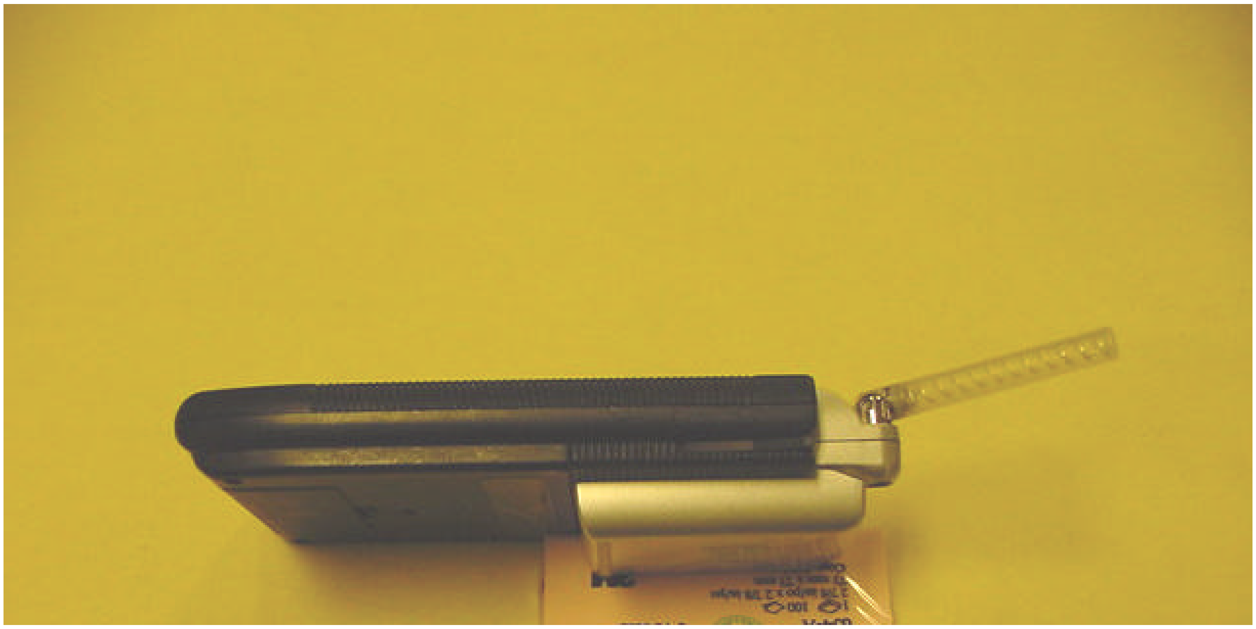
2.2 Configuration Photographs (Continued)

EUT Photo



2.2 Configuration Photographs (Continued)

EUT Photo



2.3 System Verification

Prior to the assessment, the system was verified to the ±5% of the specifications by using the system validation kit. The validation was performed at 1800 MHz.

Validation kit	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)
D900V2, S/N #: 0013	4.03	3.93

2.4 Evaluation Procedures

The SAR evaluation was performed with the following procedures:

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

b. The SAR distribution at the exposed side of the flat Phantom was measured at a distance of 30 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

c. Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

    i) 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 measurement point is 1.6 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.

    ii) 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 3-D spline interpolation algorithm. The 3-D 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. 1000 points (10 x 10 x 10) were interpolated to calculate the average.

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

d. Re-measurements of the SAR value at the same location as in step a. above. If the value changed by more than 5 %, the evaluation was repeated.

2.5 Test Results

The results on the following page(s) were obtained when the device was tested in the condition described in this report. Detail measurement data and plots, which reveal information about the location of the maximum SAR with respect to the device, are reported in Appendix A.

Measurement Results

Trade Name:	Tellus Technology	**Model No.:**	WipClip-V131C
Serial No.:	Not Labeled	**Test Engineer:**	Suresh Kondapalli

TEST CONDITIONS			
Ambient Temperature	23 ^oC	Relative Humidity	52 %
Test Signal Source	Test Mode	Signal Modulation	CDPD all 1's data
Radiated Power (ERP) Before SAR Test	26.0 dBm	Radiated Power (ERP) After SAR Test	26.0dBm
Test Duration	23 Min.	Number of Battery Change	1

EUT Position: Configuration A					
Channel MHz	Operating Mode	Crest Factor	Measured SAR_{1g} (mW/g)	Limit SAR (W/kg)	Plot Number
824	CDPD	1	0.302	1.6	1
836	CDPD	1	0.183	1.6	2
849	CDPD	1	0.175	1.6	3

See report section 1.4.2 for the configuration details of the EUT Position

EUT Position: Configuration B					
Channel MHz	Operating Mode	Crest Factor	Measured SAR_{1g} (mW/g)	Limit SAR (W/kg)	Plot Number
824	CDPD	1	0.163	1.6	4
849	CDPD	1	0.0699	1.6	5
849	CDPD	1	0.0847	1.6	6

See report section 1.4.2 for the configuration details of the EUT Position

EUT Position: Configuration C					
Channel MHz	Operating Mode	Crest Factor	Measured SAR_{1g} (mW/g)	Limit SAR (W/kg)	Plot Number
824	CDPD	1	0.172	1.6	7
849	CDPD	1	0.167	1.6	8
849	CDPD	1	0.0936	1.6	9

See report section 1.4.2 for the configuration details of the EUT Position

EUT Position: Configuration D					
Channel MHz	Operating Mode	Crest Factor	Measured SAR_{1g} (mW/g)	Limit SAR (W/kg)	Plot Number
829	CDPD	1	0.110	1.6	10
836	CDPD	1	0.127	1.6	11
849	CDPD	1	0.0779	1.6	12
824	CDPD	1	0.0893	1.6	13
836	CDPD	1	0.101	1.6	14
849	CDPD	1	0.0667	1.6	15

See report section 1.4.2 for the configuration details of the EUT Position

EUT Position: Configuration A-1					
Channel MHz	Operating Mode	Crest Factor	Measured SAR_{1g} (mW/g)	Limit SAR (W/kg)	Plot Number
824	CDPD	1	0.283	1.6	16

See report section 1.4.2 for the configuration details of the EUT Position

Note: a) Worst case data were reported
b) Uncertainty of the system is not included

3.0 TEST EQUIPMENT

3.1 Equipment List

The Specific Absorption Rate (SAR) tests were performed with the SPEAG model DASY 3 automated near-field scanning system, which is package, optimized for dosimetric evaluation of mobile radios [3].

The following major equipment/components were used for the SAR evaluations:

SAR Measurement System			
EQUIPMENT	SPECIFICATIONS	S/N #	CAL. DATE
Robot	**Stäubi RX60L**	**597412-01**	**N/A**
	Repeatability: ± 0.025mm Accuracy: 0.806×10^{-3} degree Number of Axes: 6		
E-Field Probe	**ET3DV5**	**1333**	**04/18/01**
	Frequency Range: 10 MHz to 6 GHz Linearity: ± 0.2 dB Directivity: ± 0.1 dB in brain tissue		
Data Acquisition	**DAE3**	**317**	**N/A**
	Measurement Range: 1µV to >200mV Input offset Voltage: < 1µV (with auto zero) Input Resistance: 200 M		
Phantom	**Generic Twin V3.0**	**N/A**	**N/A**
	Type: Generic Twin, Homogenous Shell Material: Fiberglass Thickness: 2 ± 0.1 mm Capacity: 20 liter Ear spacer: 4 mm (between EUT ear piece and tissue simulating liquid)		
Simulated Tissue	**Mixture**	**N/A**	**5/22/01**
	Please see section 6.2 for details		
Power Meter	**HP 435A w/ 8481H sensor**	**3607U00673**	**08/01/00**
	Frequency Range: 100kHz to 18 GHz Power Range: 300µW to 3W		

3.2 Muscle Tissue Simulating Liquid

Ingredient	**Frequency** (824-849 MHz)
Water	54.05%
Sugar	45.05%
Salt	0.1%
Bactericide	0.8 %

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C network Analyzer. The dielectric parameters were:

Frequency (MHz)	$_r$ *	*(mho/m)	**(kg/m$^{3)}$
835	51.1 ± 5%	0.88 ± 10%	1000

* *Worst case uncertainty of the HP 85070A dielectric probe kit*
** *Worst case assumption*

3.3 E-Field Probe Calibration

The manufacturer in the TEM cells ifi 110 calibrated probes. To ensure consistency, a strict protocol was followed. The conversion factor (ConF) between this calibration and the measurement in the tissue simulation solution was performed by comparison with temperature measurement and computer simulations. Probe calibration factors are included in Appendix C.

3.4 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the NIS81 [5] and the NIST 1297 [6] documents and is given in the following table. The extended uncertainty (K=2) was assessed to be 23.5 %

UNCERTAINTY BUDGET				
Uncertainty Description	**Error**	**Distrib.**	**Weight**	**Std.Dev.**
Probe Uncertainty				
Axial isotropy	±0.2 dB	U-shape	0.5	±2.4 %
Spherical isotropy	±0.4 dB	U-shape	0.5	±4.8 %
Isotropy from gradient	±0.5 dB	U-shape	0	
Spatial resolution	±0.5 %	Normal	1	±0.5 %
Linearity error	±0.2 dB	Rectang.	1	±2.7 %
Calibration error	±3.3 %	Normal	1	±3.3 %
SAR Evaluation Uncertainty				
Data acquisition error	±1 %	Rectang.	1	±0.6 %
ELF and RF disturbances	±0.25 %	Normal	1	±0.25 %
Conductivity assessment	±10 %	Rectang.	1	±5.8 %
Spatial Peak SAR Evaluation Uncertainty				
Extrapol boundary effect	±3 %	Normal	1	±3 %
Probe positioning error	±0.1 mm	Normal	1	±1 %
Integrat. and cube orient	±3 %	Normal	1	±3 %
Cube shape inaccuracies	±2 %	Rectang.	1	±1.2 %
Device positioning	±6 %	Normal	1	±6 %
Combined Uncertainties				**±11.7 %**

3.5 Measurement Tractability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards or appropriate national standards.

4.0 WARNING LABEL INFORMATION - USA

See attached page.

5.0 REFERENCES

[1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, The Institute of electrical and Electronics Engineers, Inc., New York, NY 10017, 1992

[2] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C. 20554, 1997

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.

[4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetic evaluation of mobile communications equipment with know precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp.645-652, May 1997.

[5] NIS81, NAMAS, "The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddinton, Middlesex, England, 1994.

[6] Barry N. Tayor and Chris E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994.