Specific Absorption Rate (SAR) Test Report

for

AboCom Systems, Inc.

on the

802.11b/g wireless USB dongle

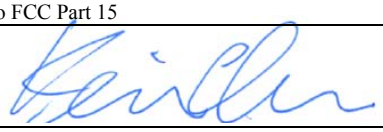
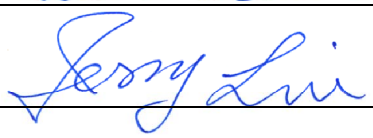
Model Number: WUG2700

Test Report: EME-060154
Issue date: Mar. 7, 2006

Total No of Pages Contained in this Report: 68

Testing Laboratory
0597

Accredited for testing to FCC Part 15

Tested by: Kevin Chen	
Reviewed by: Jerry Liu	

Review Date: Mar. 7, 2006

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1.0 General information

The device was tested at the Intertek Testing Services facility in Hsinchu, Taiwan. The maximum output power declared by the AboCom.

EUT model # WUG2700 was evaluated accordance with the requirements for compliance testing defined in FCC OET Bulletin 65, Supplement C (Edition 01-01) and meet the SAR requirement, the phantom employed was the box phantom of 2mm thick in one wall. The total uncertainty for the evaluation of the spatial peak SAR values averaged over a cube of 1g tissue mass had been assessed for this system to be ±20.6%, the dosimetry assessment system INDEXSAR SARA2 was used.

In summary, the maximum spatial peak SAR value for the sample device averaged over 1g was found to be:

Phantom	Position (worst case)	SAR_{1g}, W/kg
2mm thick box phantom wall	EUT perpendicular to the phantom, 0 mm separation.	0.076 W/kg

In conclusion, the tested Sample device was found to be in compliance with the requirements defined in OET Bulletin 65, Supplement C (Edition 01-01) for body configurations.

1.1 Client Information

The WUG2700 has been tested at the request of:

Applicant: **AboCom Systems, Inc.**
1F, No. 21, Yanfa 2nd Rd., SBIP, HsinChu City 300,
Taiwan

1.2 Equipment under test (EUT)

Product Descriptions:

For marketing purpose, the EUT is designed to be with two types of enclosure. The worst case was found to be the one with enclosure II, after test.

*Note: enclosure I: white
enclosure II: blue

Equipment	**802.11b/g wireless USB dongle**		
Trade Name	AboCom	**Model No:**	WUG2700
FCC ID	MQ4WUG2700	**S/N No.**	Not Labeled
Category	Portable	**RF Exposure**	Uncontrolled Environment
EUT Type	Production Unit		
Frequency Band	2412 – 2462 MHz	**System**	DSSS, OFDM

EUT Antenna Description			
Type	Chip antenna	**Configuration**	Fixed
Dimensions	2 x 4.5 mm	**Gain**	2dBi
Location	Embedded		

Use of Product : **802.11b/g wireless USB dongle**

Manufacturer: Same as applicant

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

EUT receive date: Feb. 6, 2006

EUT status: Normal operating condition

Test start date: Feb. 28, 2006

Test end date: Feb. 28, 2006

1.3 Test plan reference

FCC Rule: Part 2.1093, FCC's OET Bulletin 65, Supplement C (Edition 01-01) and IEEE 1528

1.4 Test configuration

Please refer to section 2.2 figure 2 ~ 5

1.4.1 Support equipment & EUT antenna position

Support Equipment				
Item #	**Equipment**	**Brand**	**Model No.**	**S/N**
1	NOTEBOOK	HP	HSTNN-I04C	CNU5240W9N

EUT

1.4.2 Test Condition

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

Usage	Operates with a portable computer	**Distance between antenna axis at the joint and the liquid surface:**	Laptop is touching the Phantom in bottom position, separating 0mm in perpendicular position	
Simulating human Head/ Body/Hand	Body	**EUT Battery**	Device is powered from host computer through battery.	
802.11b Conducted output Power	**Channel**	**Frequency MHz**	**Before SAR Test (dBm)**	**After SAR Test (dBm)**
	Low Channel - 1	2412	15.45	-
	Mid Channel - 6	2437	15.38	15.37
	High Channel- 11	2462	14.89	-
802.11g Conducted output Power	**Channel**	**Frequency MHz**	**Before SAR Test (dBm)**	**After SAR Test (dBm)**
	Low Channel – 1	2412	17.68	-
	Mid Channel – 6	2437	17.82	17.81
	High Channel- 11	2462	17.45	-

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

The conducted output power was measured before and after the test using a wideband peak power meter.

Plug the EUT into Notebook PC via USB interface, then turn on the Notebook PC power and run the test program “QA” under windows OS, which provide by manufacturer.

The EUT was transmitted continuously during the test.

With individual verifying, the maximum output power was found at 11Mbps data rate for 802.11b mode and 6Mbps data rate for 802.11g mode. The final tests were executed under these conditions and recorded in this report individually.

1.5 Modifications required for compliance

The EUT has no modifications during test.

2.0 SAR Evaluation

The evaluation of the result analysis was based on software: SARA2 Version 2.33VPM (**V**irtual **P**robe **M**iniaturization).

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

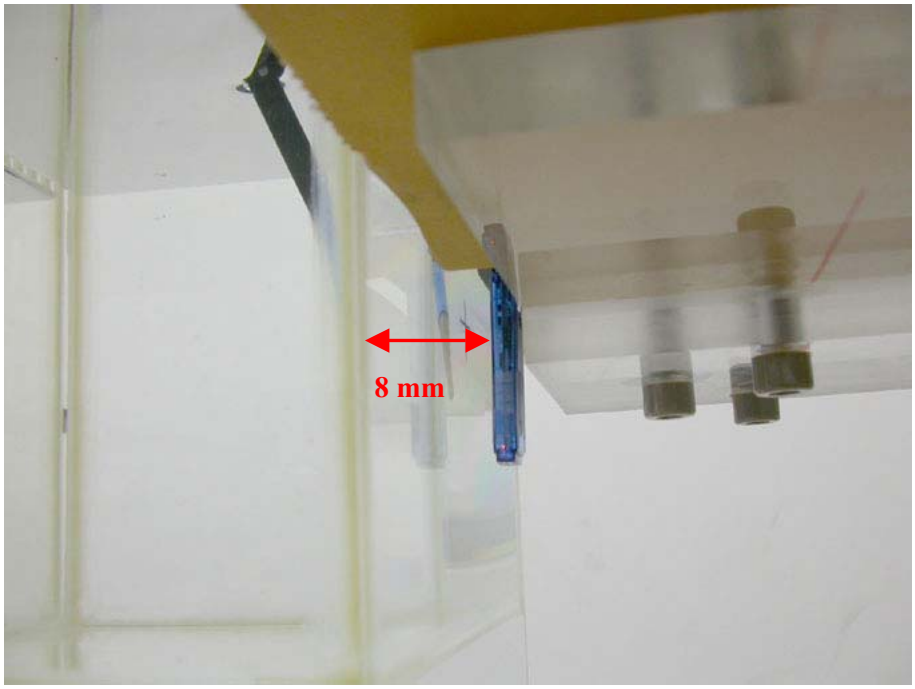
Figure 1: Test System

SAR Measurement Test Setup

Figure 2: Bottom side of Laptop facing phantom touching

SAR Measurement Test Setup

Figure 3: Bottom side of Laptop facing phantom touching - Zoon In

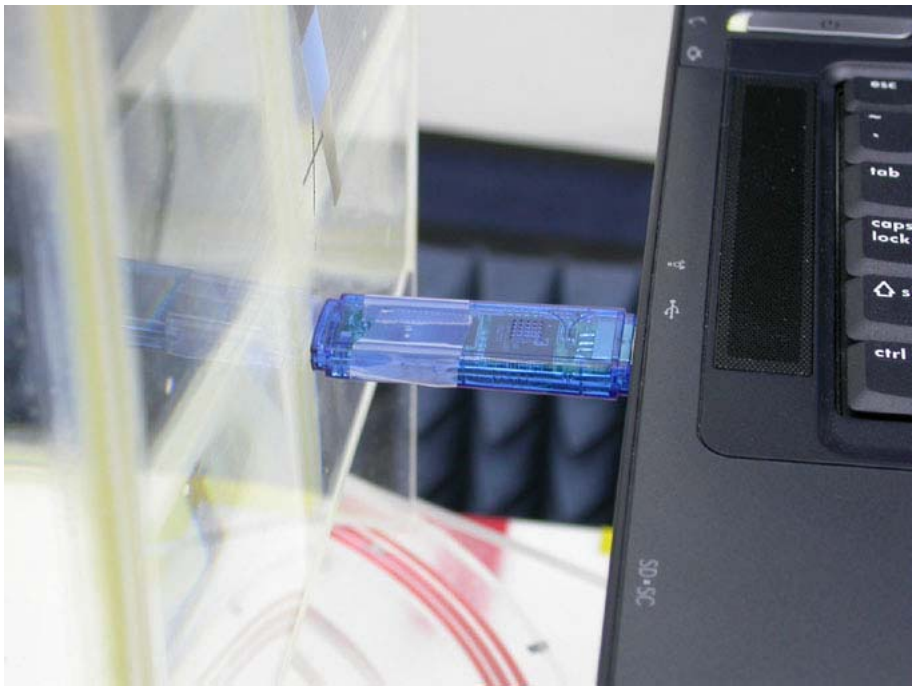


SAR Measurement Test Setup

Figure 4: EUT perpendicular to phantom, 0 mm separation

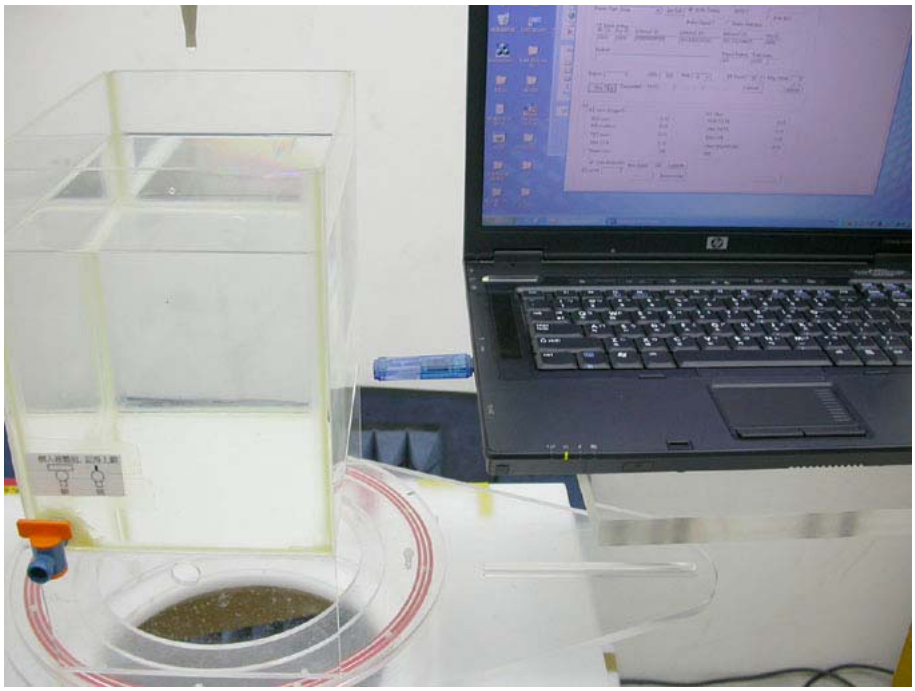
SAR Measurement Test Setup

Figure 5: EUT perpendicular to phantom, 0 mm separation - Zoon In



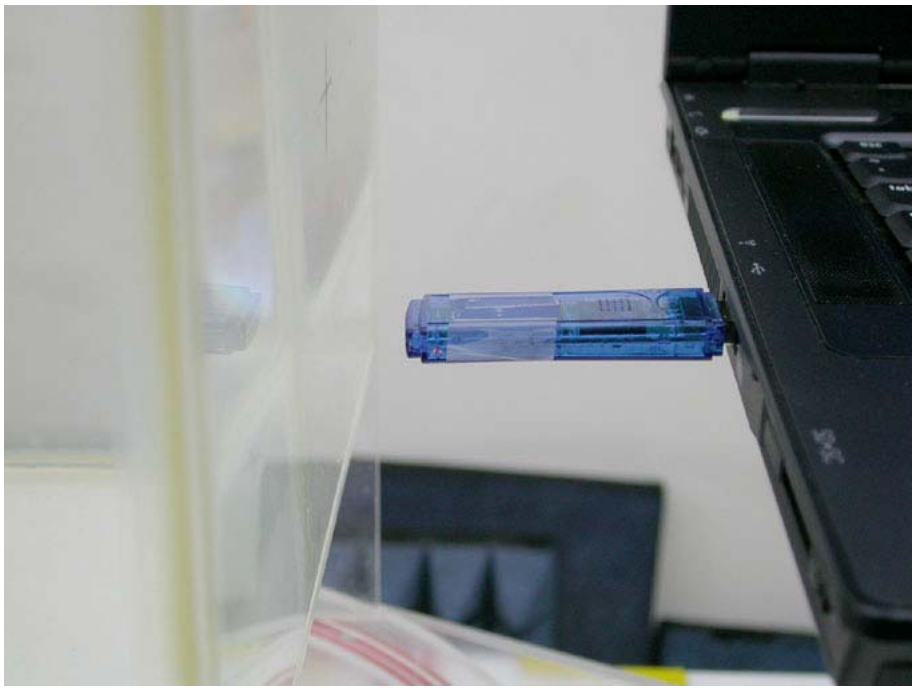
SAR Measurement Test Setup

Figure 4: EUT perpendicular to phantom, 15 mm separation



SAR Measurement Test Setup

Figure 5: EUT perpendicular to phantom, 15 mm separation - Zoon In



2.3 SAR measurement system

Robot system specification

The SAR measurement system being used is the IndexSAR SARA2 system, which consists of a Mitsubishi RV-E2 6-axis robot arm and controller, IndexSAR probe and amplifier and SAM phantom Head Shape. The robot is used to articulate the probe to programmed positions inside the phantom head to obtain the SAR readings from the DUT.

The system is controlled remotely from a PC, which contains the software to control the robot and data acquisition equipment. The software also displays the data obtained from test scans.

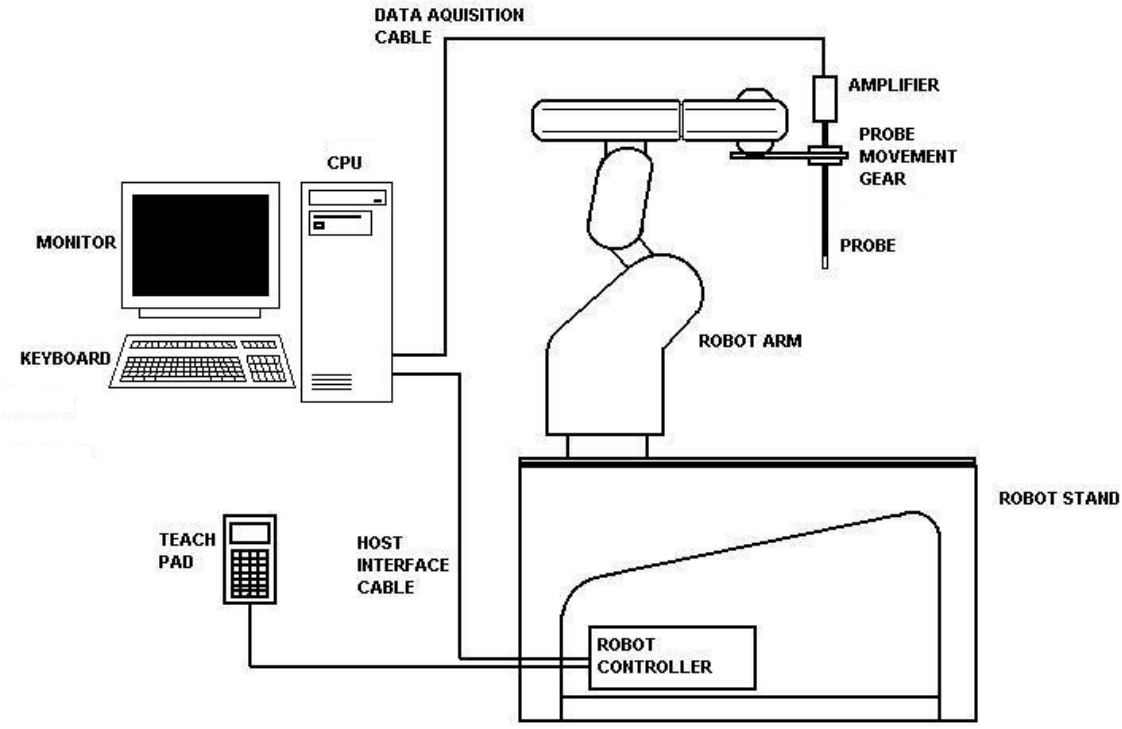


Figure 1: Schematic diagram of the SAR measurement system

The position and digitized shape of the phantom heads are made available to the software for accurate positioning of the probe and reduction of set-up time.

The SAM phantom heads are individually digitized using a Mitutoyo CMM machine to a precision of 0.02mm. The data is then converted into a shape format for the software, providing an accurate description of the phantom shell. In operation, the system first does an area (2D) scan at a fixed depth within the liquid from the inside wall of the phantom. When the maximum SAR point has been found, the system will then carry out a 3D scan central at that point to determine volume averaged SAR level.

The first 2 measurements points in a direction perpendicular to the surface of the phantom during the zoom scan and closest to the phantom surface, were only 3.5mm and the probe is kept at greater than half a diameter from the surface.

2.4 SAR measurement system validation

Prior to the assessment, the system was verified to the ±10% of the specifications by using the system validation equipments. The validation was performed at 2450 MHz on then bottom side of box phantom.

Procedures

The SAR evaluation was performed with the following procedures:

a. The SAR distribution was measured at the exposed side of the bottom of the box phantom and was measured at a distance of 15 mm for 300 ~ 1000 MHz and 10 mm for 1000 ~ 3000 MHz from the inner surface of the shell. The feed power was 1/5W.

b. The dimension for this cube is 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 5 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.

The test scans procedure for system validation also applies to the general scan procedure except for the set-up position. For general scan, the EUT was placed at the side of phantom. For validation scan, the standard dipole antenna was placed at the bottom of phantom

2.4.1 System Validation result

System Validation (2450 MHz Head)				
Frequency MHz	**Operating Mode**	**Target SAR_{1g} (W/kg)**	**Measured SAR_{1g} (W/kg)**	**Deviation (±10%)**
2450	CW	52.4	52.8	0.76%

Please see the plot below:

Date:	2005/6/1	**Position:**	Bottom of the Phantom
Filename:	2450 system validation.txt	**Phantom:**	HeadBox2-val..csv
Device Tested:	SARA2 system validation	**Head Rotation:**	0
Antenna:	2450 STD Dipole Antenna	**Test Frequency:**	2450MHz
Shape File:	none.csv	**Power Level:**	23dBm /CW

Probe: 0114

Cal File: SN0114_2450_CW_HEAD

Cal Factors:

	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.508	.508	.508

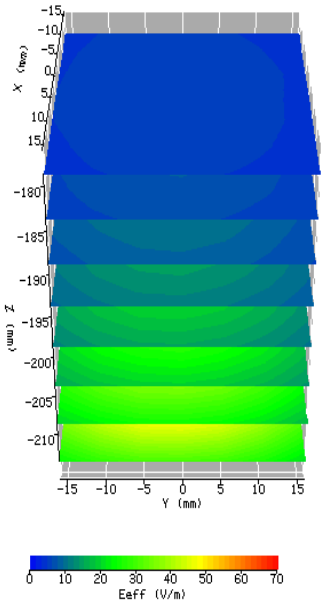
Amp Gain: 2

Averaging: 1

Batteries Replaced: -

Liquid:	15.5cm
Type:	2450MHz Head
Conductivity:	1.8441
Relative Permittivity:	38.562
Liquid Temp (deg C):	23
Ambient Temp (deg C):	23
Ambient RH (%):	55
Density (kg/m3):	1000
Software Version:	2.33VPM

Crest Factor = 1



ZOOM SCAN RESULTS:

Spot SAR (W/kg):	**Start Scan**	**End Scan**
	0.663	0.663

Change during Scan (%) 0.02

Max E-field (V/m): 64.91

Max SAR (W/kg)	**1g**	**10g**
	10.560	4.938

Location of Max (mm):	**X**	**Y**	**Z**
	-1.3	-1.3	-221.7

Normalized to an input power of 1W
Averaged over 1 cm^3 (1g) of tissue
52.8W/kg

2.4.2 System Performance Check result

System performance check (2450 MHz Head)				
Frequency MHz	**Operating Mode**	**Target SAR_{1g} (W/kg)**	**Measured SAR_{1g} (W/kg)**	**Deviation (±10%)**
2450	CW	52.4	53.035	1.212%

Please see the plot below:

Date:	2006/2/28	**Position:**	bottom of box phantom
Filename:	2450per. check.txt	**Phantom:**	HeadBox1-val..csv
Device Tested:	2450 performance check	**Head Rotation:**	0
Antenna:	2450 dipole antenna	**Test Frequency:**	2450 MHz
Shape File:	none.csv	**Power Level:**	23 dBm

Probe: 0114

Cal File: SN0114_2450_CW_HEAD

Cal Factors:

	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.508	.508	.508

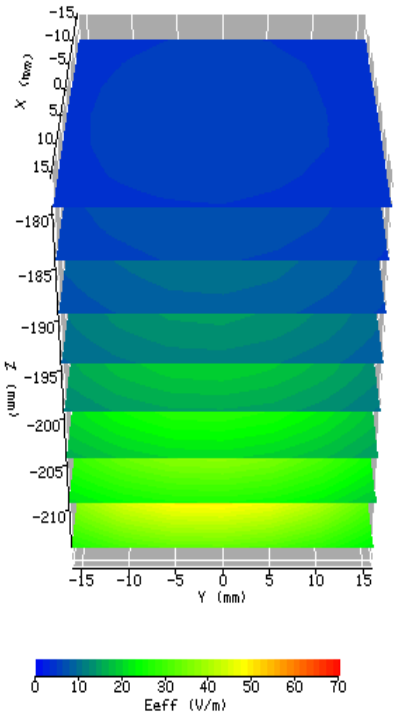
Amp Gain: 2

Averaging: 1

Batteries Replaced: -

Liquid:	15.5cm
Type:	2450 MHz Head
Conductivity:	1.834
Relative Permittivity:	38.527
Liquid Temp (deg C):	22
Ambient Temp (deg C):	23.5
Ambient RH (%):	55
Density (kg/m3):	1000
Software Version:	2.3VPM

Crest Factor = 1



ZOOM SCAN RESULTS:

	Start Scan	End Scan
Spot SAR (W/kg):	0.615	0.617

Change during Scan (%) 0.31

Max E-field (V/m): 65.97

Max SAR (W/kg)	1g	10g
	10.607	4.963

Location of Max (mm):	X	Y	Z
	0.0	-1.3	-222.2

Normalized to an input power of 1W
Averaged over 1 cm^3 (1g) of tissue
53.035W/kg

2.5 Test Result

The results on the following page(s) were obtained when the device was tested in the condition described in this report. Detailed 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:	AboCom	**Model No.:**	WUG2700
Serial No.:	Not Labled	**Test Engineer:**	Kevin Chen
TEST CONDITIONS			
Ambient Temperature	22 °C	**Relative Humidity**	58 %
Test Signal Source	Tx Mode	**Signal Modulation**	DSSS, OFDM
Output Power Before SAR Test	See section 1.4.2	**Output Power After SAR Test**	See section 1.4.2
Test Duration	23 min. each scan	**Number of Battery Change**	1

EUT Position						
Channel (MHz)	**Operating Mode**	**Crest Factor**	**Description**	**Distance (mm)**	**Measured SAR_{1g} (W/kg)**	**Plot Number**
2437	DSSS	1	Perpendicular to phantom	0	0.076	1
2437	OFDM	1	Perpendicular to phantom	0	0.024	2
2437	DSSS	1	Perpendicular to phantom	15	Note 2	3
2437	OFDM	1	Perpendicular to phantom	15	Note 2	4
2437	DSSS	1	Botten to phantom	0	0.073	5
2437	OFDM	1	Botten to phantom	0	0.038	6

Note: 1. The distance from bottom of EUT to flat phantom is 8 mm.
2. The measurement was only performed in Area Scan due to scanning system couldn't continue performing Zoom Scan with such a low SAR distribution.
3. Configuration at middle channel with more than –3dB of applicable limit.

3.0 Test Equipment

3.1 Equipment List

The Specific Absorption Rate (SAR) tests were performed with the INDEXSAR SARA2 SYSTEM.

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

SAR Measurement System			
EQUIPMENT	**SPECIFICATIONS**	Intertek ID No.	LAST CAL. DATE
Balanced Validation dipole	**2450MHz**	EC381-4	05/2005
Controller	**Mitsubishi CR-E116**	EP320-1	N/A
Robot	**Mitsubishi RV-E2**	EP320-2	N/A
	Repeatability: ± 0.04mm; Number of Axes: 6		
E-Field Probe	**IXP-050**	EC356	03/2005
	Frequency Range: 450MHz ~ 2450MHz Probe outer diameter: 5.2 mm; Length: 350 mm; Distance between the probe tip and the dipole center: 2.7 mm		
Data Acquisition	**SARA2**	N/A	N/A
	Processor: Pentium 4; Clock speed: 1.5GHz; OS: Windows XP; I/O: two RS232; Software: SARA2 Ver. 2.33VPM (**V**irtual **P**robe **M**inaturisation)		
Phantom	**2mm wall thickness box phantom**	N/A	N/A
	Shell Material: clear Perspex; Thickness: 2 ± 0.1 mm; Capacity: 152.5 x 225.5 x 200 (W x L x D) mm^3; Dielectric constant: less than 2.85 above 500MHz;		
Device holder	Material: clear Perspex; Dielectric constant: less than 2.85 above 500MHz	N/A	N/A
Simulated Tissue	**Mixture**	N/A	02/28/2006
	Please see section 3.2 for details		
Wideband Peak Power Meter/ Sensor	**Anritsu ML2487A with MA2491A power sensor**	EC396	11/11/2005
	Frequency Range: 100MHz~18GHz		
Vector Network Analyzer	**HP 8753B** **HP 85046A**	EC375	08/30/2005
	Frequency Range: 300k to 3GHz		
Signal Generator	**R&S SMR27**	EC354	09/14/2005
	Frequency Range: 10M to 27GHz, <120dBuV		

3.2 Tissue Simulating Liquid

The head and body tissue parameters should be used to test operating frequency band of transmitters. When a transmission band overlaps with one of the target frequencies, the tissue dielectric parameters of the tissue medium at the middle of a device transmission band should be within ±5% of the parameters specified at that target frequency.

3.2.1 Body Tissue Simulating Liquid for evaluation test

Body Ingredients Frequency (2.45 GHz)	
DGBE (Dilethylene Glycol Butyl Ether)	26.7%
Salt	0.04%
Water	73.2%

The dielectric parameters were verified prior to assessment using the HP 85046A dielectric probe kit and the HP 8753B network Analyzer. The dielectric parameters were:

Frequency (MHz)	Temp. (℃)	ε_r / Relative Permittivity			σ / Conductivity (mho/m)			ρ *(kg/m^3)
		measured	target	△(±5%)	measured	target	△(±5%)	
2450	22.7	50.96	52.7	-3.30%	1.96	1.95	0.51%	1000

* *Worst-case assumption*

3.2.2 Head Tissue Simulating Liquid for System performance Check test

Head Ingredients Frequency (2.45 GHz)	
DGBE (Dilethylene Glycol Butyl Ether)	53.3%
Water	46.7%

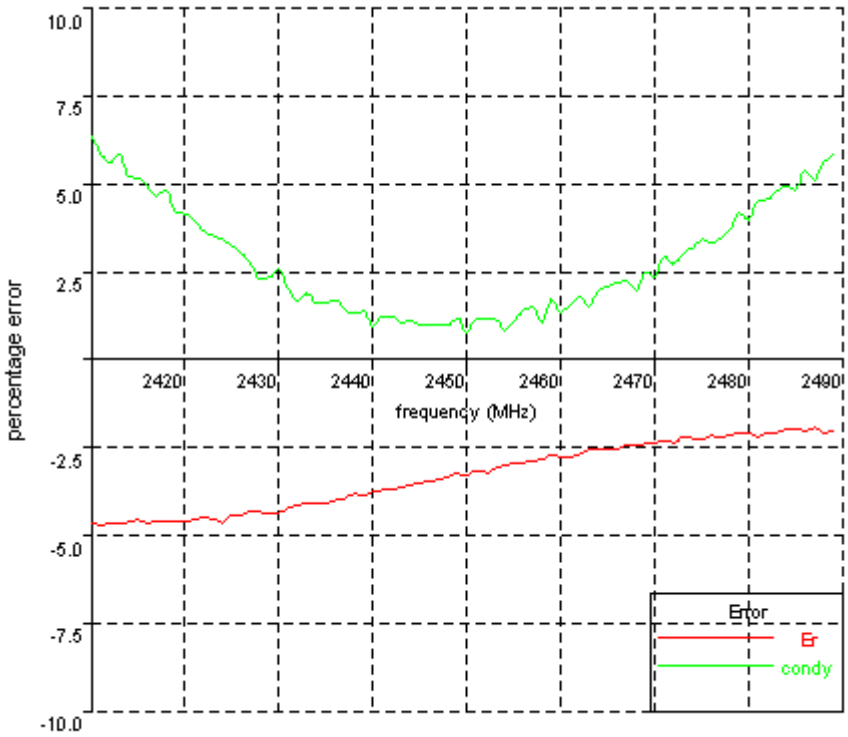
The dielectric parameters were verified prior to assessment using the HP 85046A dielectric probe kit and the HP 8753B network Analyzer. The dielectric parameters were:

Frequency (MHz)	Temp. (℃)	ε_r / Relative Permittivity			σ / Conductivity (mho/m)			ρ *(kg/m^3)
		measured	target	△(±5%)	measured	target	△(±5%)	
2450	23.5	38.53	39.2	-1.71%	1.83	1.80	-1.67%	1000

* *Worst-case assumption*

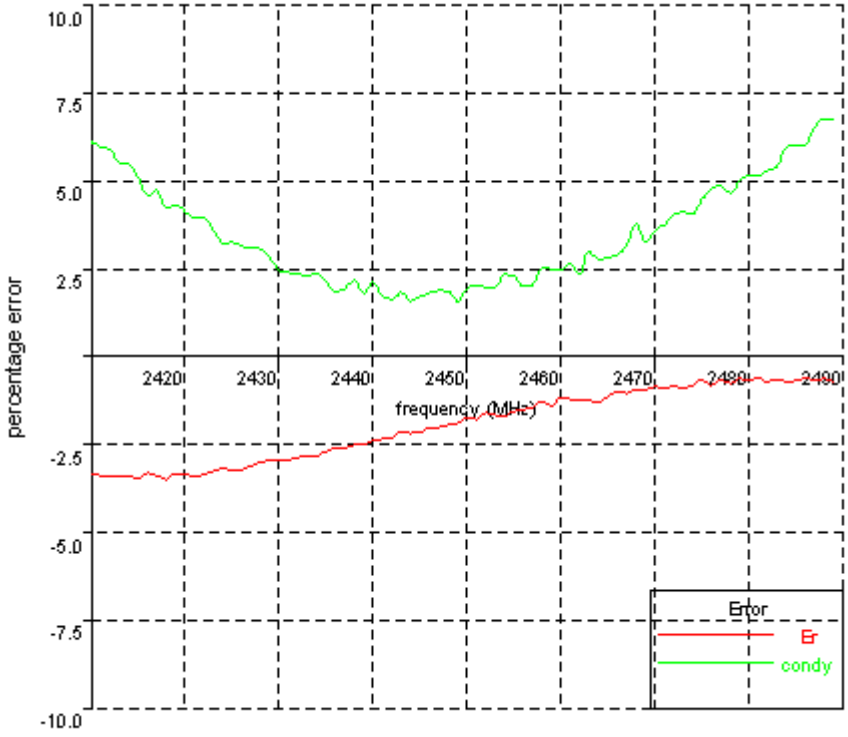
3.2.3 Body Liquid results

Date: 28 Feb. 2006	Temperature: 22.7 ℃	Type: 2450 MHz/ body	Tested by: Kevin
2410, 50.3106600685, -2.0330841402 2411, 50.2715779785, -2.0254991206 2412, 50.3055143506, -2.0207620268 2413, 50.2939633094, -2.0267532112 2414, 50.3180611417, -2.0151945131 2415, 50.3391738507, -2.0155531676 2416, 50.2902925989, -2.0116006854 2417, 50.318056725, -2.0079077075 2418, 50.3175064971, -2.0122648856 2419, 50.3198908122, -2.0009728355 2420, 50.3109893004, -2.0007082531 2421, 50.3356457108, -1.9988110626 2422, 50.3746767208, -1.9934419254 2423, 50.3394671588, -1.9917929194 2424, 50.2942519395, -1.9911202394 2425, 50.406437054, -1.988519369 2426, 50.4107238982, -1.9851650367 2427, 50.449813125, -1.981113229 2428, 50.4418448005, -1.9729389106 2429, 50.4195779927, -1.9753035647 2430, 50.4374238883, -1.9806416268 2431, 50.500666462, -1.9711012452 2432, 50.5429572199, -1.9653255123 2433, 50.577463942, -1.9705463176 2434, 50.5689224784, -1.9658372186 2435, 50.5622254503, -1.9669053309 2436, 50.6051211325, -1.9695499706 2437, 50.6347804124, -1.9654550685 2438, 50.6988248395, -1.9639625719 2439, 50.6889068253, -1.9659964235 2440, 50.734375986, -1.9589114319 2441, 50.7573284506, -1.9654349966 2442, 50.7666409855, -1.9666032717 2443, 50.7884972903, -1.9641238959 2444, 50.8321407852, -1.9655779719 2445, 50.8545813841, -1.9642126242 2446, 50.8853514459, -1.9651026497 2447, 50.9123121047, -1.966045287 2448, 50.9514002521, -1.9672668428 2449, 50.9920239108, -1.9721914753		**2450, 50.9569400597, -1.9645819302** 2451, 51.0371553564, -1.9742783991 2452, 51.0009250513, -1.9752734697 2453, 51.0679148067, -1.9772132356 2454, 51.1104943403, -1.9722131816 2455, 51.1406363155, -1.9786370286 2456, 51.1474091937, -1.9858857535 2457, 51.176765738, -1.9894488891 2458, 51.1918316093, -1.9822204573 2459, 51.265300098, -1.996592636 2460, 51.2249162846, -1.9907861449 2461, 51.226223268, -1.9965975495 2462, 51.2827030918, -2.0020627146 2463, 51.3349413396, -1.9980990494 2464, 51.3458539079, -2.0083483249 2465, 51.3342885138, -2.0127125904 2466, 51.3342885138, -2.0157491369 2467, 51.4003418012, -2.0182258621 2468, 51.3997797385, -2.0147262222 2469, 51.4119127983, -2.0262562751 2470, 51.4251733785, -2.0250347673 2471, 51.467487991, -2.0378914749 2472, 51.418823075, -2.0349662685 2473, 51.5117196495, -2.0423933022 2474, 51.494673372, -2.0471070626 2475, 51.4719418086, -2.0533913391 2476, 51.5229959734, -2.0532692807 2477, 51.506509188, -2.0569465554 2478, 51.5355083004, -2.0637138084 2479, 51.5594491611, -2.0741646542 2480, 51.5570060372, -2.0719709809 2481, 51.5101339536, -2.0845902771 2482, 51.5715258536, -2.0863511429 2483, 51.5696460715, -2.0928294533 2484, 51.6080942826, -2.0968299254 2485, 51.6214054635, -2.0961288843 2486, 51.5782970668, -2.108375122 2487, 51.6332830388, -2.1050480839 2488, 51.559192396, -2.1167500962 2489, 51.5800738689, -2.1223344873 2490, 51.6003995423, -2.1212027953	



3.2.4 Head Liquid results

Date: 28 Feb. 2006	Temperature: 23.5 ℃	Type: 2450 MHz/ head	Tested by: Kevin
2410, 37.9523479851, -1.8722165882 2411, 37.9429695977, -1.8706921619 2412, 37.9312430433, -1.8703941928 2413, 37.9358516893, -1.8642821249 2414, 37.9237126389, -1.8648960931 2415, 37.9056818381, -1.8589865686 2416, 37.9628499619, -1.8510950133 2417, 37.9333598396, -1.8545865125 2418, 37.8885477639, -1.8463239887 2419, 37.9410802054, -1.8485400366 2420, 37.9410802054, -1.8468076512 2421, 37.9116069942, -1.8444391051 2422, 37.940450968, -1.8453107938 2423, 37.9744844592, -1.8402664685 2424, 37.9990956623, -1.834249401 2425, 37.9790910083, -1.8355262385 2426, 37.9861044789, -1.8344799957 2427, 38.0187466409, -1.8346489153 2428, 38.0592772101, -1.8351818464 2429, 38.0737197265, -1.8312827162 2430, 38.0765413562, -1.8262346256 2431, 38.083864341, -1.8258206052 2432, 38.1086922212, -1.8260071472 2433, 38.1194941602, -1.8263265338 2434, 38.1213004676, -1.8280192382 2435, 38.1677088639, -1.8247264174 2436, 38.1995324315, -1.8204713442 2437, 38.2085495366, -1.8230051661 2438, 38.2374049498, -1.8281090884 2439, 38.2424689713, -1.8226563405 2440, 38.2771919409, -1.8289807052 2441, 38.2955320615, -1.822683983 2442, 38.3128571359, -1.8221292892 2443, 38.3819358049, -1.8265063458 2444, 38.3583480114, -1.823144835 2445, 38.3663762087, -1.8263530552 2446, 38.4177507138, -1.828981174 2447, 38.4195711543, -1.83119444 2448, 38.4440504271, -1.831827029 2449, 38.4656951349, -1.8275314297		**2450, 38.527137309, -1.8344786202** 2451, 38.5010285875, -1.8379952176 2452, 38.5714772496, -1.8377503086 2453, 38.5487824108, -1.8389538908 2454, 38.5243159283, -1.846567553 2455, 38.5824170559, -1.8470955761 2456, 38.6041396667, -1.8426948583 2457, 38.62207325, -1.8445998626 2458, 38.6794758734, -1.8543378303 2459, 38.6337823834, -1.8551598576 2460, 38.7271902422, -1.8556211609 2461, 38.7139512796, -1.8599552837 2462, 38.7001058624, -1.8556100126 2463, 38.6949806653, -1.8686792032 2464, 38.6788862399, -1.8657929929 2465, 38.7458001932, -1.8676215385 2466, 38.7856920609, -1.8701437911 2467, 38.7704078054, -1.8763682383 2468, 38.8084391591, -1.8884403195 2469, 38.802309538, -1.8802598856 2470, 38.8389565054, -1.8871644857 2471, 38.82365126, -1.891493336 2472, 38.8489614268, -1.8976696973 2473, 38.81651914, -1.9005304981 2474, 38.854170851, -1.9002772901 2475, 38.9024639855, -1.9088475785 2476, 38.8466412992, -1.9153199644 2477, 38.9048031189, -1.9184681033 2478, 38.8717474193, -1.9157566758 2479, 38.9190694004, -1.9229079423 2480, 38.8964394907, -1.9274901746 2481, 38.9313305263, -1.9282463027 2482, 38.8763166247, -1.9321540828 2483, 38.9097237625, -1.9350637174 2484, 38.877655861, -1.9466273632 2485, 38.8929760123, -1.9491579038 2486, 38.9130295593, -1.9497266752 2487, 38.8982622307, -1.9604916823 2488, 38.9052572228, -1.9658711664 2489, 38.8780642529, -1.9670436439 2490, 38.8498509495, -1.9743540556	



3.3 E-Field Probe and 2450 Balanced Dipole Antenna Calibration

Probe calibration factors and dipole antenna calibration are included in Appendix C.

4.0 Measurement Uncertainty

The uncertainty budget has been determined for the INDEXSAR SARA2 measurement system according to IEEE P1528 documents [3] and is given in the following table. The extended uncertainty (95% confidence level) was assessed to be 20.6 % for SAR measurement, and the extended uncertainty (95% confidence level) was assessed to be 20.2 % for system performance check.

Table 1 Exposure Assessment Uncertainty
Example of measurement uncertainty assessment SAR measurement

a	b			c	d	e		f	g	h	I
Uncertainty Component	Sec.	Tol. (+/-)			Prob. Dist.	Divisor (descrip)	Divisor (value)	c1 (1g)	c1 (10g)	Standard Uncertainty (%) 1g	Standard Uncertainty (%) 10g
		(dB)		(%)							
Measurement System											
Probe Calibration	E2.1			2.5	N	1 or k	1	1	1	2.50	2.50
Axial Isotropy	E2.2	0.25	5.93	5.93	R	√3	1.73	0	0	0.00	0.00
Hemispherical Isotropy	E2.2	0.45	10.92	10.92	R	√3	1.73	1	1	6.30	6.30
Boundary effect	E2.3		4	4.00	R	√3	1.73	1	1	2.31	2.31
Linearity	E2.4	0.04	0.93	0.93	R	√3	1.73	1	1	0.53	0.53
System Detection Limits	E2.5		1	1.00	R	√3	1.73	1	1	0.58	0.58
Readout Electronics	E2.6		1	1.00	N	1 or k	1.00	1	1	1.00	1.00
Response time	E2.7		0	0.00	R	√3	1.73	1	1	0.00	0.00
Integration time	E2.8		1.4	1.40	R	√3	1.73	1	1	0.81	0.81
RF Ambient Conditions	E6.1		3	3.00	R	√3	1.73	1	1	1.73	1.73
Probe Positioner Mechanical Tolerance	E6.2		0.6	0.60	R	√3	1.73	1	1	0.35	0.35
Probe Position wrt. Phantom Shell	E6.3		3	3.00	R	√3	1.73	1	1	1.73	1.73
SAR Evaluation Algorithms	E5		8	8.00	R	√3	1.73	1	1	4.62	4.62
Test Sample Related											
Test Sample Positioning	E4.2		2	2.00	N	1	1.00	1	1	2.00	2.00
Device Holder Uncertainty	E4.1		2	2.00	N	1	1.00	1	1	2.00	2.00
Output Power Variation	6.6.2		5	5.00	R	√3	1.73	1	1	2.89	2.89
Phantom and Tissue Parameters											
Phantom Uncertainty (shape and thickness)	E3.1		4	4.00	R	√3	1.73	1	1	2.31	2.31
Liquid conductivity (Deviation from target)	E3.2		5	5.00	R	√3	1.73	0.64	0.43	1.85	1.24
Liquid conductivity (measurement uncert.)	E3.3		1.1	1.10	N	1	1.00	0.64	0.43	0.70	0.47
Liquid permittivity (Deviation from target)	E3.2		5	5.00	R	√3	1.73	0.6	0.49	1.73	1.41
Liquid permittivity (measurement uncert.)	E3.3		1.1	1.10	N	1	1.00	0.6	0.49	0.66	0.54
Combined standard uncertainty					**RSS**					10.5	10.3
Expanded uncertainty	(95% Confidence Level)				k=2					**20.6**	**20.3**

Table 2 System Check (Verification)

Example of measurement uncertainty assessment for system performance check

a	b			c	d	e		f	g	h	I
Uncertainty Component	Sec.	Tol. (+/-)			Prob. Dist.	Divisor (descrip)	Divisor (value)	c1 (1g)	c1 (10g)	Standard Uncertainty (%) 1g	Standard Uncertainty (%) 10g
		(dB)		(%)							
Measurement System											
Probe Calibration	E2.1			2.5	N	1 or k	1	1	1	2.50	2.50
Axial Isotropy	E2.2	0.25	5.93	5.93	R	√3	1.73	0	0	0.00	0.00
Hemispherical Isotropy	E2.2	0.45	10.92	10.92	R	√3	1.73	1	1	6.30	6.30
Boundary effect	E2.3		4	4.00	R	√3	1.73	1	1	2.31	2.31
Linearity	E2.4	0.04	0.93	0.93	R	√3	1.73	1	1	0.53	0.53
System Detection Limits	E2.5		1	1.00	R	√3	1.73	1	1	0.58	0.58
Readout Electronics	E2.6		1	1.00	N	1 or k	1.00	1	1	1.00	1.00
Response time	E2.7		0	0.00	R	√3	1.73	1	1	0.00	0.00
Integration time	E2.8		1.4	1.40	R	√3	1.73	1	1	0.81	0.81
RF Ambient Conditions	E6.1		3	3.00	R	√3	1.73	1	1	1.73	1.73
Probe Positioner Mechanical Tolerance	E6.2		0.6	0.60	R	√3	1.73	1	1	0.35	0.35
Probe Position wrt. Phantom Shell	E6.3		3	3.00	R	√3	1.73	1	1	1.73	1.73
SAR Evaluation Algorithms	E5		8	8.00	R	√3	1.73	1	1	4.62	4.62
Dipole											
Dipole axis to liquid distance	8, E4.2		2	2.00	N	1	1.00	1	1	2.00	2.00
Input power and SAR drift measurement	8, 6.6.2		5	5.00	R	√3	1.73	1	1	2.89	2.89
Phantom and Tissue Parameters											
Phantom Uncertainty (thickness)	E3.1		4	4.00	R	√3	1.73	1	1	2.31	2.31
Liquid conductivity (Deviation from target)	E3.2		5	5.00	R	√3	1.73	0.64	0.43	1.85	1.24
Liquid conductivity (measurement uncert.)	E3.3		1.1	1.10	N	1	1.00	0.64	0.43	0.70	0.47
Liquid permittivity (Deviation from target)	E3.2		5	5.00	R	√3	1.73	0.6	0.49	1.73	1.41
Liquid permittivity (measurement uncert.)	E3.3		1.1	1.10	N	1	1.00	0.6	0.49	0.66	0.54
Combined standard uncertainty					**RSS**					10.3	10.1
Expanded uncertainty	(95% Confidence Level)				k=2					**20.2**	**19.9**

5.0 WARNING LABEL INFORMATION - USA

See user manual.

6.0 REFERENCES

[1] ANSI, *ANSI/IEEE C95.1-1999: 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, 1999

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

[3] IEEE Standards Coordinating Committee 34, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", IEEE Std 1528™-2003

[4] Industry Canada, "Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields", Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.

7.0 Document Revision Record

Revision/ Job Number	Writer Initials	Date	Change
N/A	Y.Y.	Mar. 7, 2006	Original document

APPENDIX A - SAR Evaluation Data

Power drift: Power drift is the measurement of power drift of the device over one complete SAR scan.

To assess the drift of the power of the device under test, a SAR measurement was made in the middle of the zoom scan volume at the start of the scan and a measurement at this point was then also made after the measurement scan. The difference between the two measurements should be less than 5%.

Plot #1 (1/2)

Date:	2006/2/28	**Position:**	Per. 0mm to phantom
Filename:	WUG2700 per0-11b_ch6.txt	**Phantom:**	HeadBox2-test.csv
Device Tested:	WUG2700	**Head Rotation:**	0
Antenna:	Chip Ant.	**Test Frequency:**	11b_2437MHz
Shape File:	WUG2700_per.csv	**Power Level:**	15.38 dBm

Probe: 0114

Cal File: SN0114_2450_CW_BODY

Cal Factors:

	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.585	.585	.585

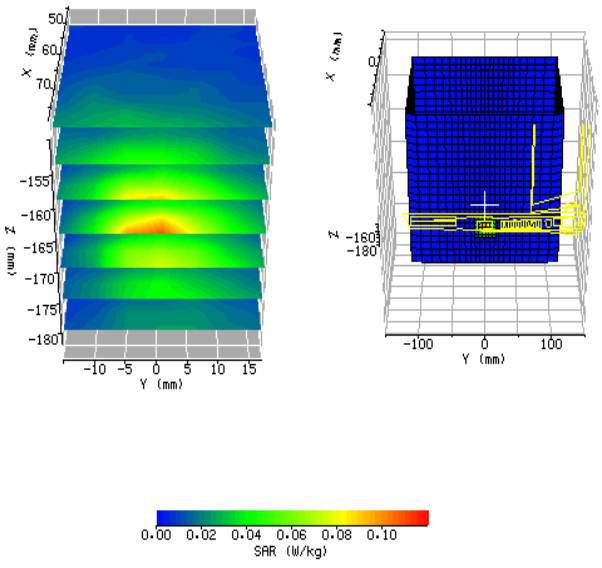
Amp Gain: 2

Averaging: 1

Batteries Replaced: -

Liquid:	15.5cm
Type:	2450 MHz Body
Conductivity:	1.965
Relative Permittivity:	50.957
Liquid Temp (deg C):	22
Ambient Temp (deg C):	22
Ambient RH (%):	58
Density (kg/m3):	1000
Software Version:	2.33VPM

Crest Factor = 1



ZOOM SCAN RESULTS:

Spot SAR (W/kg):	**Start Scan**	**End Scan**
	0.018	0.020

Change during Scan (%) 3.33

Max E-field (V/m): 7.44

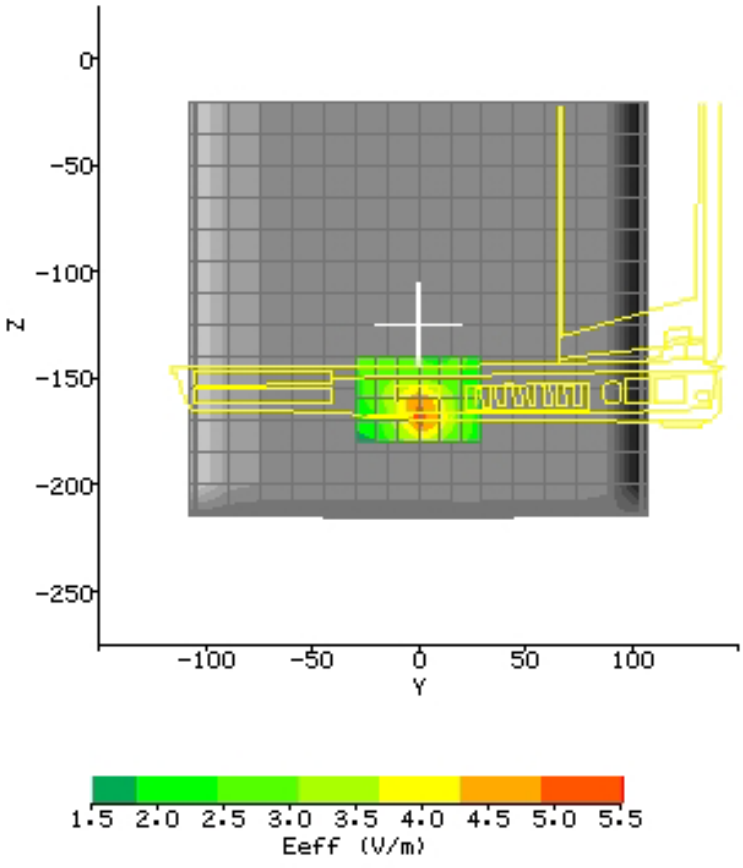
Max SAR (W/kg)	**1g**	**10g**
	0.076	0.034

Location of Max (mm):	**X**	**Y**	**Z**
	78.0	-15.0	-165.1

Plot #1 (2/2)

AREA SCAN:

Scan Extent:		Min	Max	Steps
	Y	-30.0	30.0	6.0
	Z	-180.0	-140.0	4.0



Plot #2 (1/2)

Date:	2006/2/28	**Position:**	Per. 0mm to phantom
Filename:	WUG2700 per0-11g_ch6.txt	**Phantom:**	HeadBox2-test.csv
Device Tested:	WUG2700	**Head Rotation:**	0
Antenna:	Chip Ant.	**Test Frequency:**	11g_2437MHz
Shape File:	WUG2700_per.csv	**Power Level:**	17.82 dBm

Probe: 0114

Cal File: SN0114_2450_CW_BODY

Cal Factors:

	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.585	.585	.585

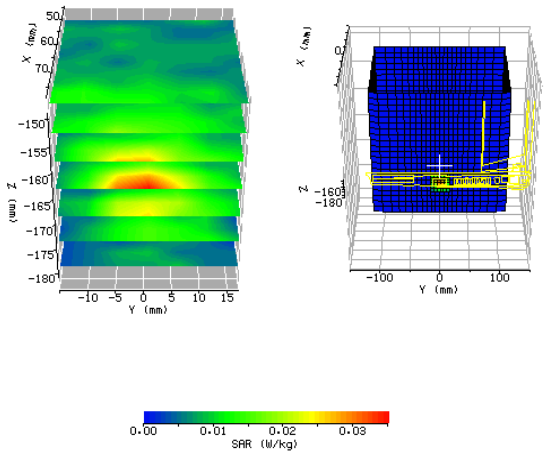
Amp Gain: 2

Averaging: 1

Batteries Replaced: -

Liquid:	15.5cm
Type:	2450 MHz Body
Conductivity:	1.965
Relative Permittivity:	50.957
Liquid Temp (deg C):	22
Ambient Temp (deg C):	22
Ambient RH (%):	58
Density (kg/m3):	1000
Software Version:	2.33VPM

Crest Factor = 1



ZOOM SCAN RESULTS:

Spot SAR (W/kg):	**Start Scan**	**End Scan**
	0.007	0.007

Change during Scan (%) 0

Max E-field (V/m): 4.22

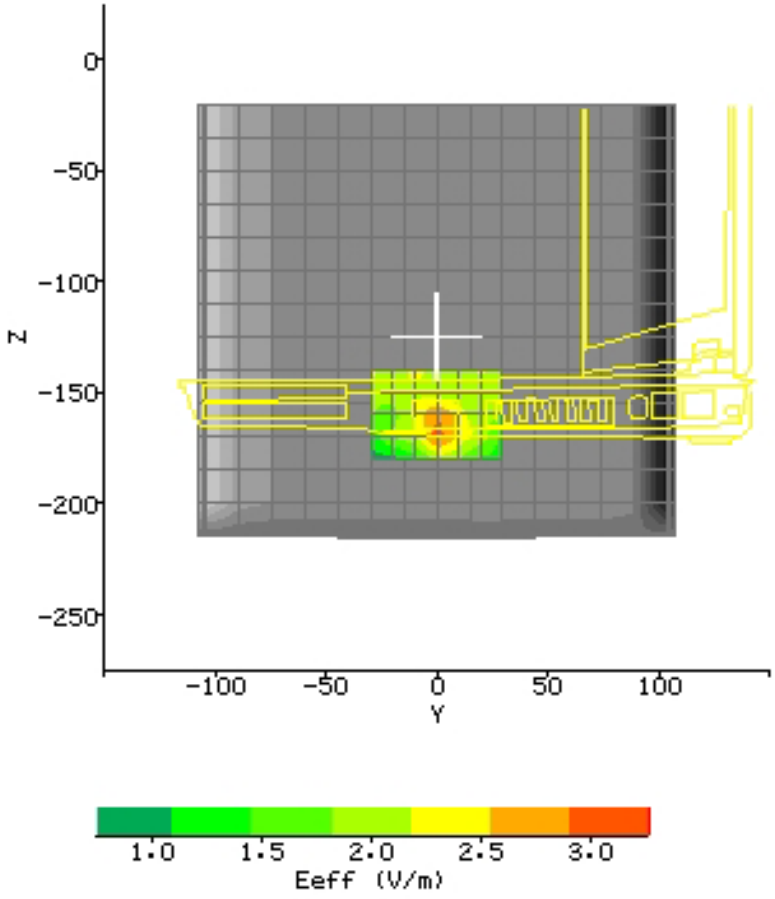
Max SAR (W/kg)	**1g**	**10g**
	0.024	0.012

Location of Max (mm):	**X**	**Y**	**Z**
	78.0	-15.0	-164.1

Plot #2 (2/2)

AREA SCAN:

Scan Extent:		Min	Max	Steps
	Y	-30.0	30.0	6.0
	Z	-180.0	-140.0	4.0



Plot #3(1/2)

Date:	2006/2/28	**Position:**	Per. 15mm to phantom
Filename:	WUG2700 per15-11b_ch6a.txt	**Phantom:**	HeadBox2-test.csv
Device Tested:	WUG2700	**Head Rotation:**	0
Antenna:	Chip Ant.	**Test Frequency:**	11b_2437MHz
Shape File:	WUG2700_per.csv	**Power Level:**	15.38 dBm

Probe: 0114

Cal File: SN0114_2450_CW_BODY

Cal Factors:

	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.585	.585	.585

Amp Gain: 2

Averaging: 1

Batteries Replaced: -

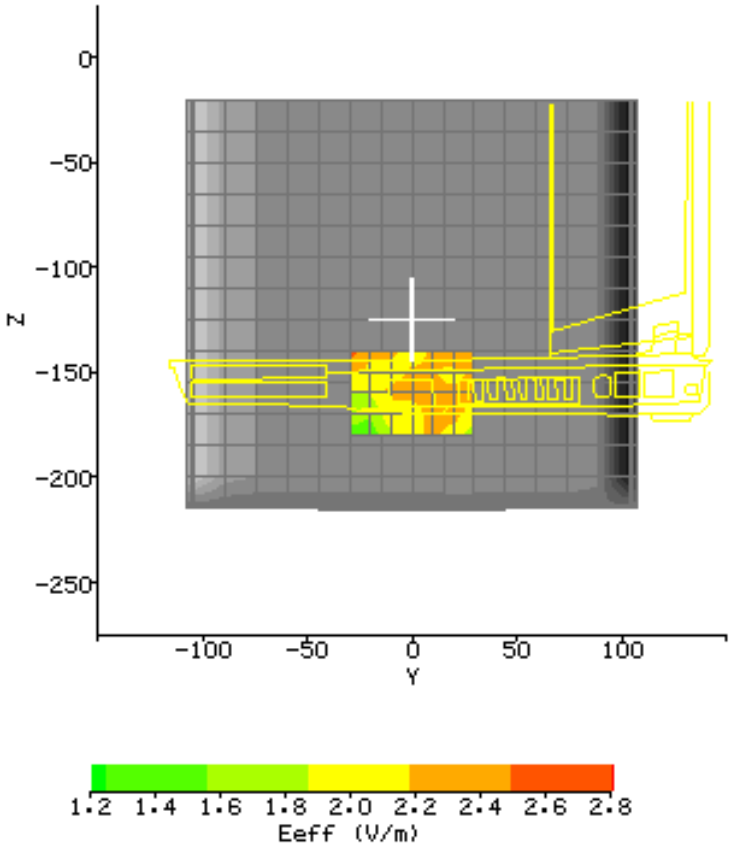
Liquid:	15.5cm
Type:	2450 MHz Body
Conductivity:	1.965
Relative Permittivity:	50.957
Liquid Temp (deg C):	22
Ambient Temp (deg C):	22
Ambient RH (%):	58
Density (kg/m3):	1000
Software Version:	2.33VPM

Plot #3 (2/2)

AREA SCAN:

Scan Extent:

	Min	Max	Steps
Y	-30.0	30.0	6.0
Z	-180.0	-140.0	4.0



Plot #4 (1/2)

Date:	2006/2/28	**Position:**	Per. 15mm to phantom
Filename:	WUG2700 per15-11g_ch6a.txt	**Phantom:**	HeadBox2-test.csv
Device Tested:	WUG2700	**Head Rotation:**	0
Antenna:	Chip Ant.	**Test Frequency:**	11g_2437MHz
Shape File:	WUG2700_per.csv	**Power Level:**	17.82 dBm

Probe: 0114

Cal File: SN0114_2450_CW_BODY

Cal Factors:

	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.585	.585	.585

Amp Gain: 2

Averaging: 1

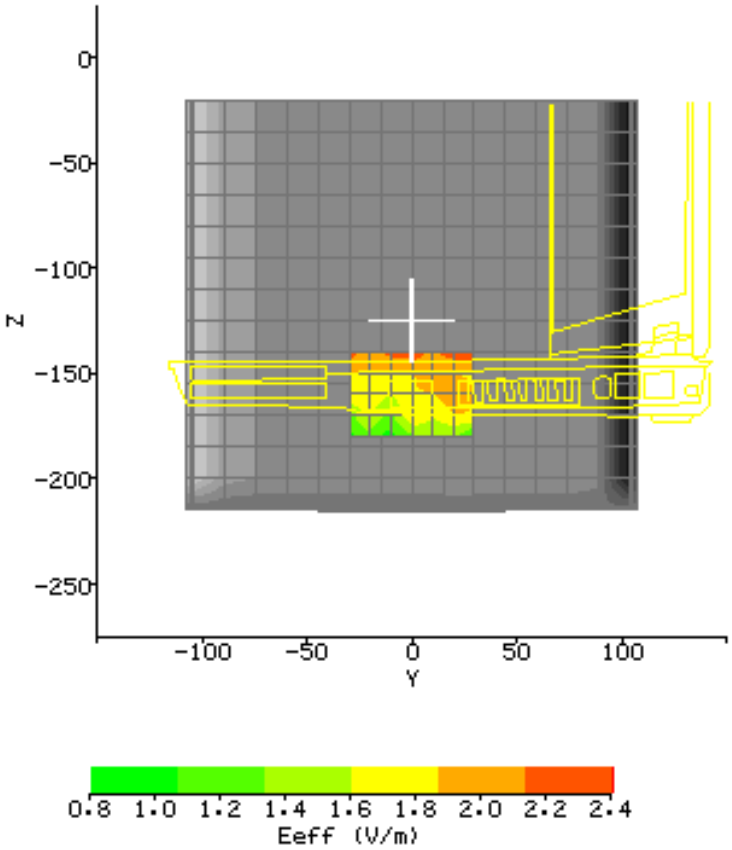
Batteries Replaced: -

Liquid:	15.5cm
Type:	2450 MHz Body
Conductivity:	1.965
Relative Permittivity:	50.957
Liquid Temp (deg C):	22
Ambient Temp (deg C):	22
Ambient RH (%):	58
Density (kg/m3):	1000
Software Version:	2.33VPM

Plot #4(2/2)

AREA SCAN:

Scan Extent:		Min	Max	Steps
	Y	-30.0	30.0	6.0
	Z	-180.0	-140.0	4.0



Plot #5 (1/2)

Date:	2006/2/28	**Position:**	Bot. 0mm to phantom
Filename:	WUG2700 bot0-11b_ch6.txt	**Phantom:**	HeadBox2-test.csv
Device Tested:	WUG2700	**Head Rotation:**	0
Antenna:	Chip Ant.	**Test Frequency:**	11b_2437MHz
Shape File:	WUG2700_bot.csv	**Power Level:**	15.38 dBm

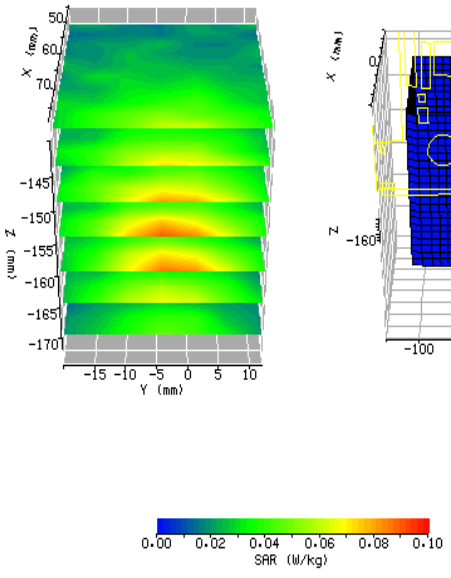
Probe: 0114
Cal File: SN0114_2450_CW_BODY

Cal Factors:

	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.585	.585	.585

Amp Gain: 2
Averaging: 1
Batteries Replaced: -

Liquid:	15.5cm
Type:	2450 MHz Body
Conductivity:	1.965
Relative Permittivity:	50.957
Liquid Temp (deg C):	22
Ambient Temp (deg C):	22
Ambient RH (%):	58
Density (kg/m3):	1000
Software Version:	2.33VPM



ZOOM SCAN RESULTS:

pot SAR (W/kg):	**Start Scan**	**End Scan**
	0.025	0.026

hange during can (%) 3.90
Iax E-field (V/m): 6.82

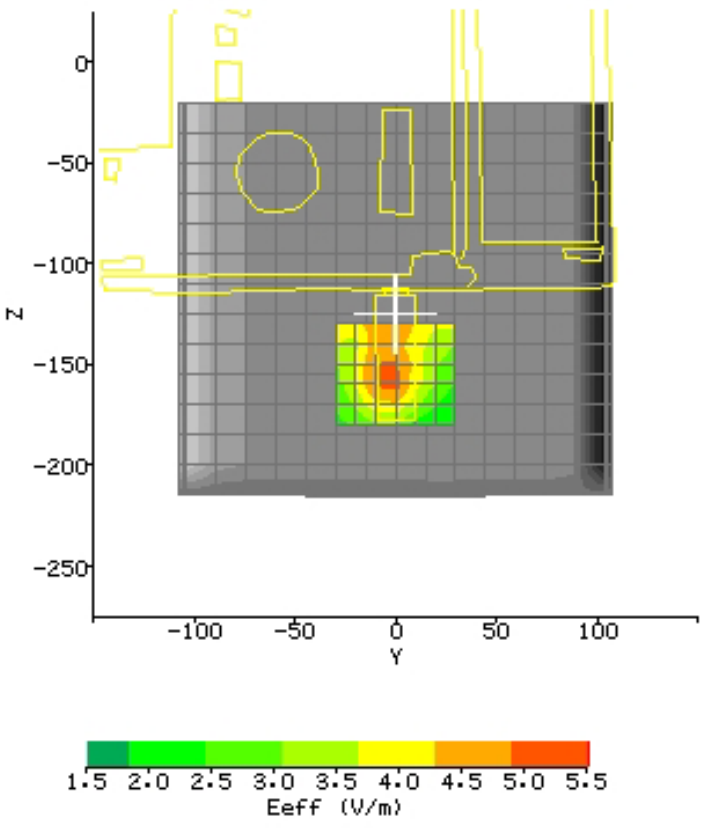
Iax SAR (W/kg)	**1g**	**10g**
	0.073	0.043

ocation of Max nm):	**X**	**Y**	**Z**
	78.0	-20.0	-156.9

Plot #5(2/2)

AREA SCAN:

Scan Extent:		Min	Max	Steps
	Y	-30.0	30.0	6.0
	Z	-180.0	-130.0	5.0



Plot #6 (1/2)

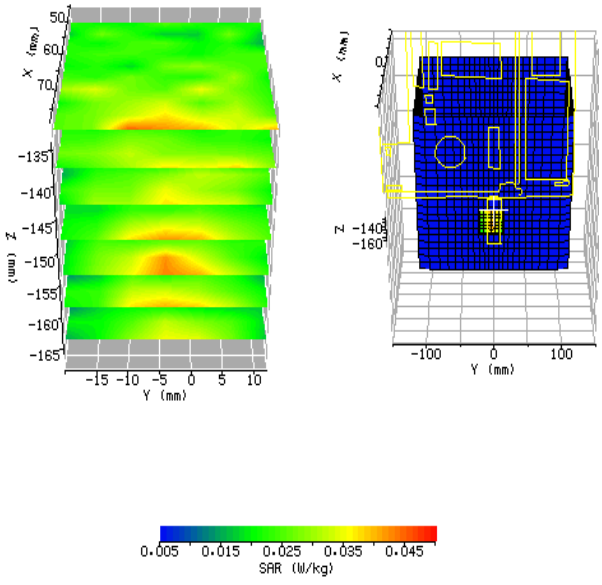
Date:	2006//28	**Position:**	Bot. 0mm to phantom
Filename:	WUG2700 bot0-11g_ch6.txt	**Phantom:**	HeadBox2-test.csv
Device Tested:	WUG2700	**Head Rotation:**	0
Antenna:	Chip Ant.	**Test Frequency:**	11g_2437MHz
Shape File:	WUG2700_bot.csv	**Power Level:**	17.82 dBm

Probe: 0114
Cal File: SN0114_2450_CW_BODY

Cal Factors:	X	Y	Z
Air	438	359	403
DCP	20	20	20
Lin	.585	.585	.585

Amp Gain: 2
Averaging: 1
Batteries Replaced: -

Liquid:	15.5cm
Type:	2450 MHz Body
Conductivity:	1.965
Relative Permittivity:	50.957
Liquid Temp (deg C):	22
Ambient Temp (deg C):	22
Ambient RH (%):	58
Density (kg/m3):	1000
Software Version:	2.33VPM



ZOOM SCAN RESULTS:

Spot SAR (W/kg):	Start Scan	End Scan
	0.022	0.022

Change during Scan (%) 0
Max E-field (V/m): 4.83

Max SAR (W/kg)	1g	10g
	0.038	0.028

Location of Max (mm):	X	Y	Z
	78.0	-20.0	-134.0