SAR EVALUATION REPORT

For

AMBIT Microsystems Corporation

4-1, Ming Shen Street, Tu Chen Industrial District.
Tu Chen, Taipei Hsien 236, Taiwan, R.O.C.

FCC ID: MCLT60H677

April 24, 2003

This Report Concerns:	Equipment Type:
☒ Original Report	802.11b Wireless PC Card

Test Engineer:	Eric Hong
Report No.:	R0301172S
Test Date:	April 19, 2003
Reviewed By:	Benjamin Jing
Prepared By:	Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

Note: This test report is specially limited to the above client company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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SUMMARY

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996 [1].

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

The investigation was limited to the worst-case scenario from the device usage point of view. For the clarity of data analysis, and clarity of presentation, only one tissue simulation was used for the head and body simulation. This means that if SAR was found at the headset position, the magnitude of SAR would be overestimated comparing to SAR to a headset placed in the ear region.

There was no SAR of any concern measured on the device for any of the investigated configurations, please see following table for testing result summary:

Ambient Temperature (ºC): 23.0
Relative Humidity (%): 49.3

Worst case SAR reading

Antenna	Antenna Position	EUT Position	Ch (MHz)	Conducted Power (dBm)	Worst case SAR, averaged over 1g [mW/g]			
					Setup condition (applicable checked)		Measured	Limit
					Antenna	Phantom		
BY27	Right	1.5cm Separation with Phantom	2437	16.37	Built-in	Flat	0.678	1.6
		Bottom Touch Phatom	2437	16.37			0.0177	1.6
		Perpendicular to Phantom	2437	16.37			0.125	1.6
	Left	1.5cm Separation with Phantom	2437	16.37			0.303	1.6
		Bottom Touch Phatom	2437	16.37			0.0745	1.6
		Perpendicular to Phantom	2437	16.37			0.0045	1.6
ZG1S	Right	1.5cm Separation with Phantom	2437	16.53			0.127	1.6
		Bottom Touch Phatom	2437	16.53			0.0117	1.6
		Perpendicular to Phantom	2437	16.53			0.0043	1.6
	Left	1.5cm Separation with Phantom	2437	16.37			0.0216	1.6
		Bottom Touch Phatom	2437	16.37			0.466	1.6
		Perpendicular to Phantom	2437	16.37			0.0190	1.6
ZI1S	Right	1.5cm Separation with Phantom	2437	16.37			0.163	1.6
		Bottom Touch Phatom	2437	16.37			0.0052	1.6
		Perpendicular to Phantom	2437	16.37			0.0038	1.6
	Left	1.5cm Separation with Phantom	2437	16.53			0.0571	1.6
		Bottom Touch Phatom	2437	16.53			0.133	1.6
		Perpendicular to Phantom	2437	16.53			0.0298	1.6

1 - REFERENCE

[1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.

[2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, O_ce of Engineering & Technology, Washington, DC, 1997.

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

[4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \ Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.

[5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.

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

[7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM _ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.

[8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-_eld probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.

[9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The depen-dence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.

[10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.

[11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

[12] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.Dosimetric Evaluation of Sample device, month 1998 9

[13] NIS81 NAMAS, \The treatment of uncertainity in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.

[14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10

2 - TESTING EQUIPMENT

2.1 Equipments List & Calibration Info

Type / Model	Cal. Date	S/N:
DASY3 Professional Dosimetric System	N/A	N/A
Robot RX60L	N/A	F00/5H31A1/A/01
Robot Controller	N/A	F01/5J72A1/A/01
Dell Computer Optiplex GX110	N/A	N/A
Pentium III, Windows NT	N/A	N/A
SPEAG EDC3	N/A	N/A
SPEAG DAE3	6/02	456
SPEAG E-Field Probe ET3DV6	9/7/02	1604
SPEAG Dummy Probe	N/A	N/A
SPEAG Generic Twin Phantom	N/A	N/A
SPEAG Light Alignment Sensor	N/A	278
Apprel Validation Dipole D-1800-S-2	11/6/01	BCL-049
SPEAG Validation Dipole D900V2	9/3/02	122
Brain Equivalent Matter (800MHz)	Daily	N/A
Brain Equivalent Matter (1900MHz)	Daily	N/A
Brain Equivalent Matter (2450MHz)	Daily	N/A
Muscle Equivalent Matter (800MHz)	Daily	N/A
Muscle Equivalent Matter (1900MHz)	Daily	N/A
Muscle Equivalent Matter (2450MHz)	Daily	N/A
Robot Table	N/A	N/A
Phone Holder	N/A	N/A
Phantom Cover	N/A	N/A
HP Spectrum Analyzer HP8593GM	6/20/02	3009A00791
Microwave Amp. 8349B	N/A	2644A02662
Power Meter HP436A	4/2/02	2709A29209
Power Sensor HP8482A	4/2/02	2349A08568
Signal Generator RS SMIQ O3	2/10/02	1084800403
Network Analyzer HP-8753ES	7/30/02	820079
Dielectric Probe Kit HP85070A	N/A	N/A
Apprel Validation Dipole D-2450-S-1	10/1/02	BCL-141

2.2 Equipment Calibration Certificate

Please see the attached file.

Engineering

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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type	ET3DV6
Serial Number:	1604
Place of Assessment	Zurich
Date of Assessment:	October 4, 2002
Probe Calibration Date:	August 26, 2002

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:

Conversion Factor ($\pm$ standard deviation)

150 MHz	**ConvF**	**9.2 $\pm$ 8%**	ε_r = 52.3 σ = 0.76 mho/m (head tissue)
300 MHz	**ConvF**	**8.0 $\pm$ 8%**	ε_r = 45.3 σ = 0.87 mho/m (head tissue)
450 MHz	**ConvF**	**7.3 $\pm$ 8%**	ε_r = 43.5 σ = 0.87 mho/m (head tissue)
2450 MHz	**ConvF**	**4.7 $\pm$ 8%**	ε_r = 39.2 σ = 1.80 mho/m (head tissue)
150 MHz	**ConvF**	**8.8 $\pm$ 8%**	ε_r = 61.9 σ = 0.80 mho/m (body tissue)
450 MHz	**ConvF**	**7.7 $\pm$ 8%**	ε_r = 56.7 σ = 0.94 mho/m (body tissue)
2450 MHz	**ConvF**	**4.3 $\pm$ 8%**	ε_r = 52.7 σ = 1.95 mho/m (body tissue)

Schmid & Partner Engineering AG

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

Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1604**
Place of Calibration:	**Zurich**
Date of Calibration:	**August 26, 2002**
Calibration Interval:	**12 months**

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

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

Calibrated by:

Approved by:

DASY3 - Parameters of Probe: ET3DV6 SN:1604

Sensitivity in Free Space

NormX	**1.73**	$\mu V/(V/m)^2$
NormY	**1.68**	$\mu V/(V/m)^2$
NormZ	**1.72**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**93**	mV
DCP Y	**93**	mV
DCP Z	**93**	mV

Sensitivity in Tissue Simulating Liquid

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

ConvF X	**6.5**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.5**	± 9.5% (k=2)	Alpha	**0.36**
ConvF Z	**6.5**	± 9.5% (k=2)	Depth	**2.82**

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

ConvF X	**5.5**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.5**	± 9.5% (k=2)	Alpha	**0.50**
ConvF Z	**5.5**	± 9.5% (k=2)	Depth	**2.46**

Boundary Effect

Head **900 MHz** **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	11.1	6.6
SAR_{be} [%]	With Correction Algorithm	0.4	0.6

Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	12.3	8.1
SAR_{be} [%]	With Correction Algorithm	0.1	0.1

Sensor Offset

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

Body 2450 Mhz Liquid Measurement, 4/19/03

frequency	e'	e''
2400000000.0000	54.5118	14.7360
2402000000.0000	54.5262	14.7931
2404000000.0000	54.5506	14.7889
2406000000.0000	54.4894	14.7954
2408000000.0000	54.4682	14.8009
2410000000.0000	54.4541	14.7883
2412000000.0000	54.4470	14.8297
2414000000.0000	54.4098	14.7988
2416000000.0000	54.4236	14.8109
2418000000.0000	54.4359	14.8087
2420000000.0000	54.4159	14.8240
2422000000.0000	54.3864	14.8518
2424000000.0000	54.4004	14.8453
2426000000.0000	54.3846	14.8320
2428000000.0000	54.3650	14.8589
2430000000.0000	54.3636	14.8626
2432000000.0000	54.3277	14.8716
2434000000.0000	54.3348	14.8714
2436000000.0000	54.3608	14.8647
2438000000.0000	54.3110	14.8684
2440000000.0000	54.3248	14.8753
2442000000.0000	54.3142	14.8614
2444000000.0000	54.3091	14.8634
2446000000.0000	54.2958	14.8994
2448000000.0000	54.2967	14.9037
2450000000.0000	54.2744	14.9269
2452000000.0000	54.2471	14.9389
2454000000.0000	54.2929	14.9415
2456000000.0000	54.2927	14.9499
2458000000.0000	54.2919	14.9534
2460000000.0000	54.2953	14.9954
2462000000.0000	54.2636	14.9825
2464000000.0000	54.2656	14.9914
2466000000.0000	54.2803	14.9912
2468000000.0000	54.2555	14.9855
2470000000.0000	54.2252	15.0007
2472000000.0000	54.2030	14.9819
2474000000.0000	54.2205	15.0057
2476000000.0000	54.2166	15.0308
2478000000.0000	54.2244	15.0186
2480000000.0000	54.2014	15.0087
2482000000.0000	54.1897	15.0307
2484000000.0000	54.1926	15.0442
2486000000.0000	54.1819	15.0573
2488000000.0000	54.1513	15.0745
2490000000.0000	54.1517	15.0639
2492000000.0000	54.1358	15.0980
2494000000.0000	54.1393	15.0793
2496000000.0000	54.1467	15.0943
2498000000.0000	54.1379	15.1217
2500000000.0000	54.1422	15.1009

$s = w\, e_o\, e" = 2\, p\, f\, e_o\, e" = 2.03$ (Target Value = 1.95)
where $f = 2450$
$e_o = 8.854 \times 10^{-12}$
$e" = 14.9269$

Head 2450 Mhz Liquid Measurement, 4/19/03

frequency	e'	e''
2400000000.0000	38.7334	13.2535
2402083333.3333	38.7703	13.2333
2404166666.6667	38.6766	13.2535
2406250000.0000	38.6355	13.2563
2408333333.3333	38.5864	13.2746
2410416666.6667	38.5252	13.2583
2412500000.0000	38.5247	13.2678
2414583333.3333	38.5327	13.2843
2416666666.6667	38.5891	13.2925
2418750000.0000	38.5905	13.2818
2420833333.3333	38.6172	13.2897
2422916666.6667	38.5700	13.3042
2425000000.0000	38.5027	13.3293
2427083333.3333	38.4310	13.3296
2429166666.6667	38.3985	13.3722
2431250000.0000	38.3692	13.3702
2433333333.3333	38.3802	13.4202
2435416666.6667	38.3824	13.4141
2437500000.0000	38.4034	13.4195
2439583333.3333	38.4285	13.4633
2441666666.6667	38.4185	13.4593
2443750000.0000	38.3562	13.4792
2445833333.3333	38.3756	13.4952
2447916666.6667	38.3773	13.5161
2450000000.0000	38.2840	13.5267
2452083333.3333	38.2788	13.5539
2454166666.6667	38.2833	13.5918
2456250000.0000	38.2672	13.5807
2458333333.3333	38.2232	13.5986
2460416666.6667	38.3330	13.6294
2462500000.0000	38.3378	13.6305
2464583333.3333	38.3734	13.6727
2466666666.6667	38.3447	13.6775
2468750000.0000	38.2600	13.6912
2470833333.3333	38.2220	13.7150
2472916666.6667	38.2408	13.7347
2475000000.0000	38.2673	13.7275
2477083333.3333	38.2873	13.7385
2479166666.6667	38.3319	13.7699
2481250000.0000	38.3327	13.7830
2483333333.3333	38.3581	13.7727
2485416666.6667	38.3700	13.7621
2487500000.0000	38.3160	13.7688
2489583333.3333	38.2448	13.8102
2491666666.6667	38.2718	13.7955
2493750000.0000	38.2368	13.8136
2495833333.3333	38.2825	13.7920
2497916666.6667	38.3332	13.8272
2500000000.0000	38.3406	13.8102

$s = w e_o e'' = 2 p f e_o e'' = 1.84$ *(Target Value = 1.80)*

where $f = 2450$

$e_o = 8.854 \times 10^{-12}$

$e'' = 13.5267$

3 - EUT DESCRIPTION

Applicant:	AMBIT Microsystems Corporation
Product Description:	802.11b Wireless PC Card (This EUT is a portable device of identical prototype, which is within 20cm from human body.)
Product Name:	T60H677
FCC ID:	MCLT60H677
Serial Number:	None
Transmitter Frequency:	2.4-2.4835GHz
Maximum Output Power:	0.046W (for 802.11b)
Dimension:	2.4"L x 1.7"W x 0.1"H
RF Exposure environment:	General Population/Uncontrolled
Power Supply:	ASTEC AC Adapter, M/N: SA80-3115
Applicable Standard	FCC CFR 47, Part 15 Subpart C
Application Type:	Certification

1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

Note: The test data was good for test sample only. It may have deviation for other test samples.

4 - SYSTEM TEST CONFIGURATION

4.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

4.2 EUT Exercise Software and Procedure

The EUT exercising program used during SAR testing was designed to exercise the various system components in a manner similar to a typical use. The software, PRISM utilities, contained on the hard drive, is auto starting on power-up. Once loaded, the program sequentially exercises each system component.

The testing procedure is as follows:

1. Click PRISM test utilities on Window
2. Select wireless LAN Adapter under adapters list
3. Select low, mid and high channels under Radio Channels
4. Select Tx Rate of 11MB
5. Click on “continuous Tx” bottom

4.3 Special Accessories

All interface cables used for compliance testing are shielded as normally supplied by INMAC, Monster Cable and their respective support equipment manufacturer. The EUT is featured shielded metal connectors.

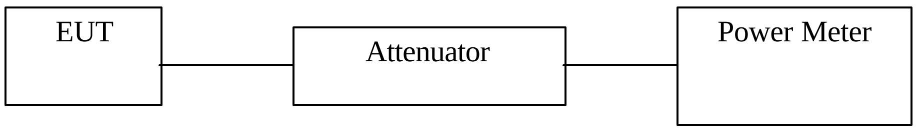
4.4 Equipment Modifications

No modification(s) were made to ensure that the EUT complies with the applicable limits.

5 - CONDUCTED OUTPUT POWER MEASUREMENT

5.1 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.



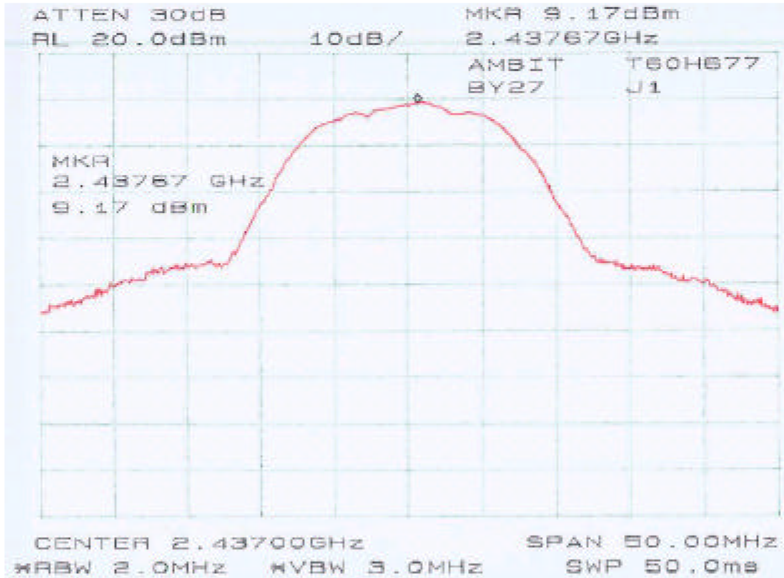
5.2 Test Results

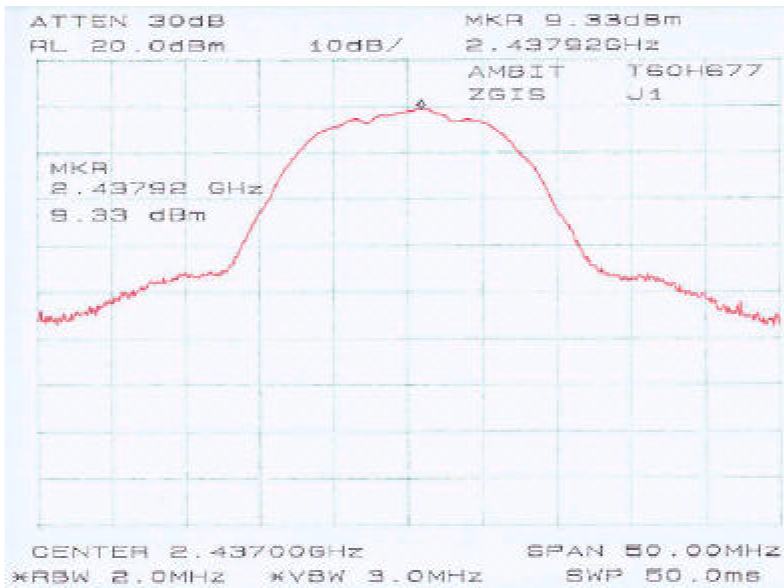
Port	Antenna	Frequency (MHz)	Output Power (dBm)	Correction Factor (dB)	Corrected Output Power (dBm)	Corrected Output Power (mW)	Standard (W)	Result
J1	BY27	2437.42	9.17	7.2	16.37	43.35	≤ 1W	Compliant
	ZGIS	2438.00	9.33	7.2	16.53	44.98	≤ 1W	Compliant
	ZI1S	2438.17	9.17	7.2	16.37	43.35	≤ 1W	Compliant
J2	BY27	2437.67	9.17	7.2	16.37	43.35	≤ 1W	Compliant
	ZGIS	2437.58	9.17	7.2	16.37	43.35	≤ 1W	Compliant
	ZI1S	2437.83	9.33	7.2	16.53	44.98	≤ 1W	Compliant

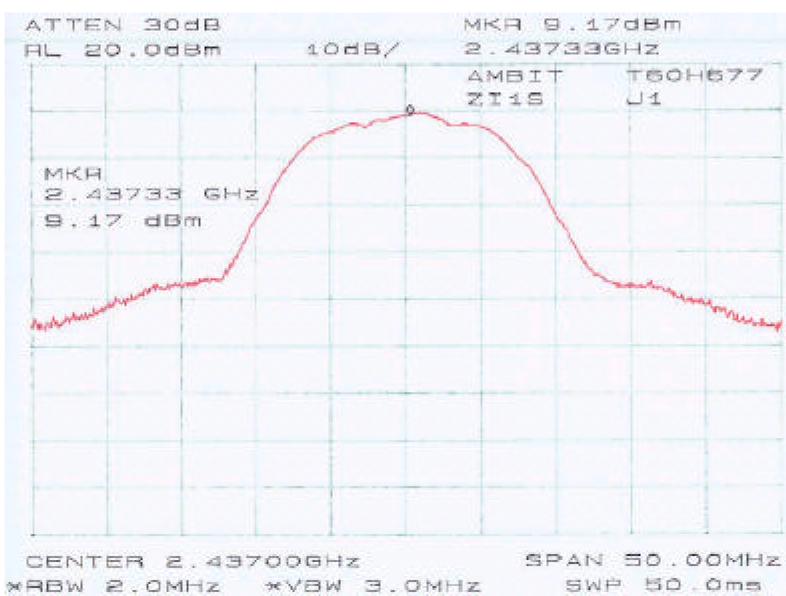
Note: The power output may depend on the intended use of the EUT. For all tests, the EUT was set to maximum conditions.

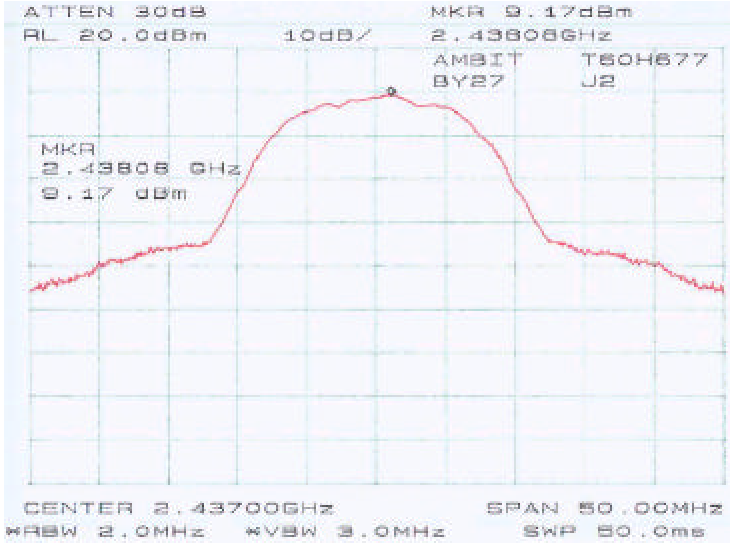
5.3 Measurement Plots

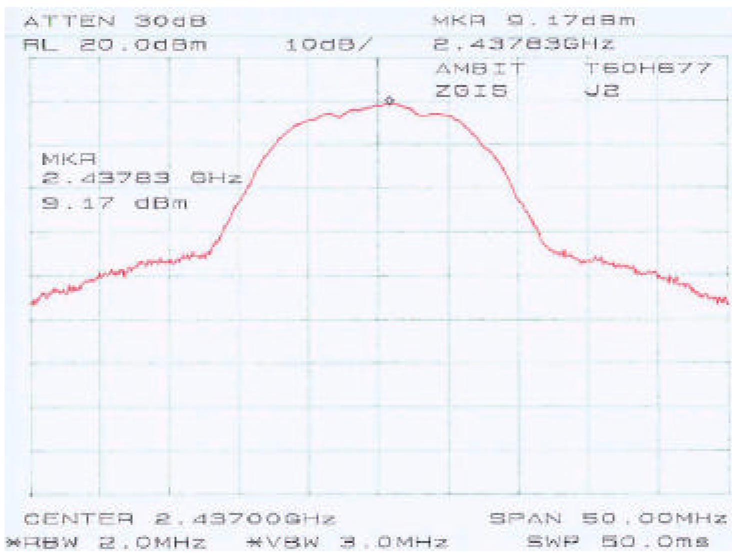
Please refer to the plots hereinafter.

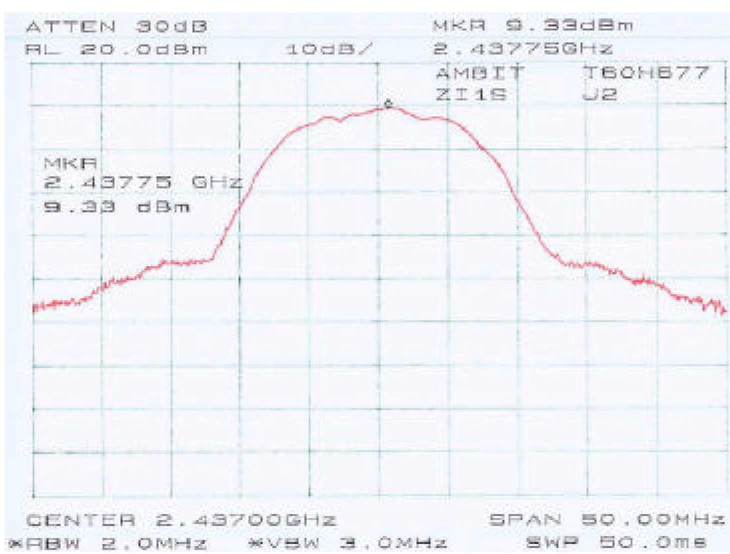

ATTEN 30dB
RL 20.0dBm 10dB/
MKR 9.17dBm
2.43767GHz
AMBIT T60H677
BY27 J1
MKR
2.43767 GHz
9.17 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz *VBW 3.0MHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm 10dB/
MKR 9.33dBm
2.43792GHz
AMBIT T60H677
ZGIS J1
MKR
2.43792 GHz
9.33 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz *VBW 3.0MHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm 10dB/
MKR 9.17dBm
2.43733GHz
AMBIT T60H677
ZI1S J1
MKR
2.43733 GHz
9.17 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz *VBW 3.0MHz
SWP 50.0ms


ATTEN 30dB
MKR 9.17dBm
RL 20.0dBm
10dB/
2.43808GHz
AMBIT
T60H677
BY27
J2
MKR
2.43808 GHz
9.17 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 30dB
MKR 9.17dBm
RL 20.0dBm
10dB/
2.43783GHz
AMBIT
T60H677
ZGI5
J2
MKR
2.43783 GHz
9.17 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 30dB
MKR 9.33dBm
RL 20.0dBm
10dB/
2.43775GHz
AMBIT
T60H677
ZI16
J2
MKR
2.43775 GHz
9.33 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms

6 - DOSIMETRIC ASSESSMENT SETUP

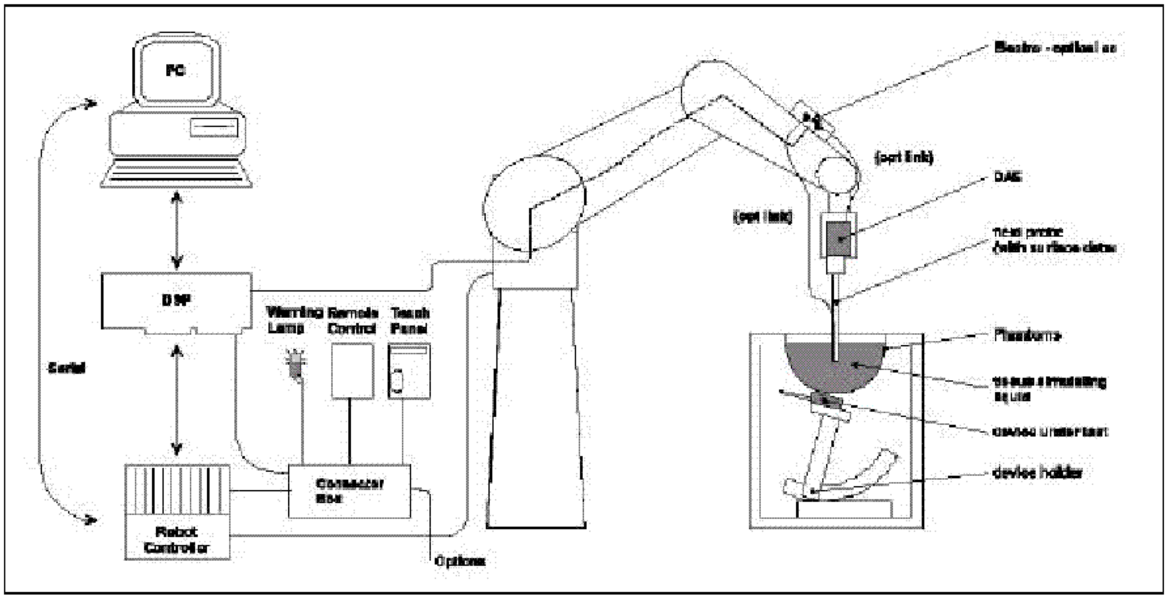
These measurements were performed with the automated near-field scanning system DASY3 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ±0.02mm. Special 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 to the data acquisition unit. The system is described in detail in [3].

The SAR measurements were conducted with the dosimetric probe ET3DV6 SN: 1604 (manufactured by SPEAG), designed in the classical triangular configuration [3] and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in [8] and found to be better than ±0.25dB.

The phantom used was the \Generic Twin Phantom" described in [4]. The ear was simulated as a spacer of 4 mm thickness between the earpiece of the phone and the tissue simulating liquid. The Tissue simulation liquid used for each test is in according with the FCC OET65 supplement C as listed below.

Ingredients	Frequency (MHz)									
(% by weight)	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (Nacl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	55.2	42.0	55.9	39.9	53.3	39.2	52.7
Conductivity (s/m)	0.85	0.83	0.91	0.97	1.0	0.98	1.42	1.52	1.8	1.95

6.1 Measurement System Diagram

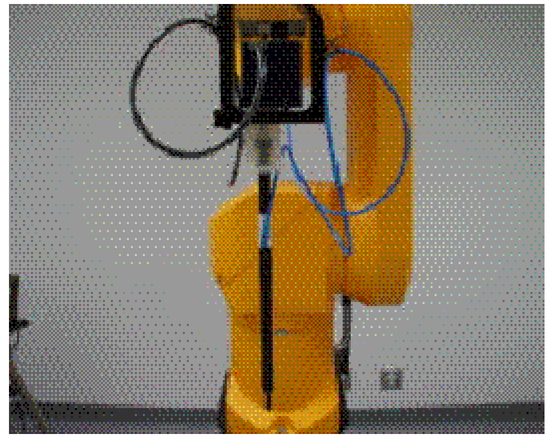


The DASY3 system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
2. An arm extension for accommodating the data acquisition electronics (DAE).
3. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
4. A data acquisition electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
5. A unit to operate the optical surface detector, which is connected to the EOC. The Electro-optical coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the PC plug-in card. The functions of the PC plug-in card based on a DSP is to perform the time critical task such as signal filtering, surveillance of the robot operation fast movement interrupts.
6. A computer operating Windows 95 or larger
7. DASY3 software
8. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling testing left-hand and right-hand usage.
10. The device holder for handheld EUT.
11. Tissue simulating liquid mixed according to the given recipes (see Application Note).
12. System validation dipoles to validate the proper functioning of the system.

6.2 System Components

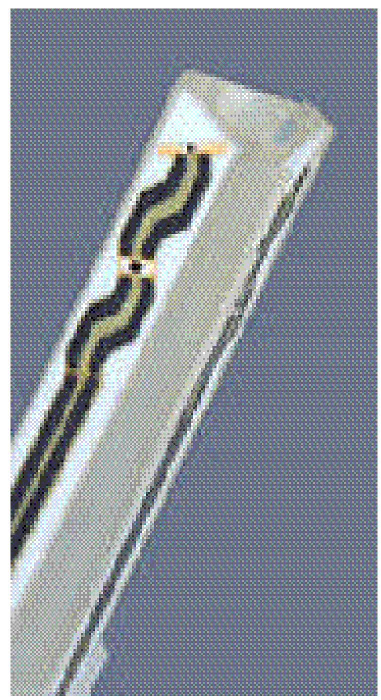
ET3DV6 Probe Specification



Photograph of the probe

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

The SAR measurements were conducted with the dosimetric probe ET3DV6 designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY3 software reads the reflection during a software approach and looks for the maximum using a 2 nd order fitting. The approach is stopped when reaching the maximum.



Inside view of ET3DV6 E-field Probe

E-Field Probe Calibration Process

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/-0.25dB. 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 bellow 1 GHz, and in a waveguide 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 dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Data Evaluation

The DASY3 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe Parameter:	-Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	-Conversion Factor	ConvFi
	-Diode compression point	Dcp_i
Device parameter:	-Frequency	f
	-Crest Factor	cf
Media parameter:	-Conductivity	ó
	-Density	ñ

These parameters must be set correctly in the software. They can either be found in the component documents or be imported into the software from the configuration files issued for the DASY3 components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

$$Vi = Ui + (Ui)^2 \, cf / dcp_i$$

With Vi = compensated signal of channel i (i =x, y, z)
Ui = input signal of channel i (i =x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

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

E-field probes: $$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes: $$H_i = \sqrt{Vi} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

With Vi = compensated signal of channel i (i =x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i =x, y, z)
ìV/ $(V/m)^2$ for E-field probes
ConF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strenggy of channel i in V/m
H_i = diode compression point (DASY parameter)

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

$$E_{tot} = \text{Square Root } [(E_x)^2 + (E_y)^2 + (E_z)^2]$$

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

$$SAR = (E_{tot})^2 \quad ó/(ñ \quad 1000)$$

With SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
ó = conductivity in [mho/m] or [Siemens/m]
ñ = equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

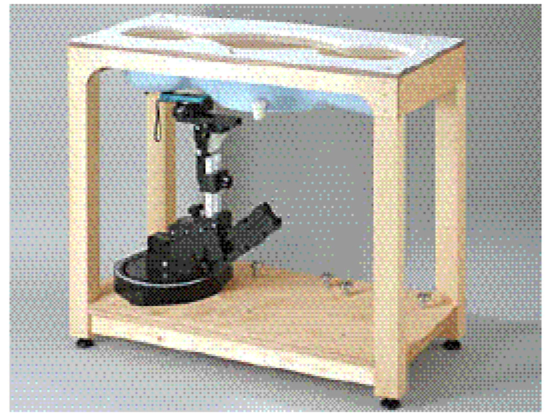
The power flow density is calculated assuming the excitation field as a free space field.

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

With P_{pwe} = equivalent power density of a plane wave in mW/cm3
E_{tot} = total electric filed strength in V/m
H_{tot} = total magnetic filed strength in V/m

Generic Twin 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 [9][10]. 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 allows the complete setup of all predefined phantom positions and measurement grids by 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)

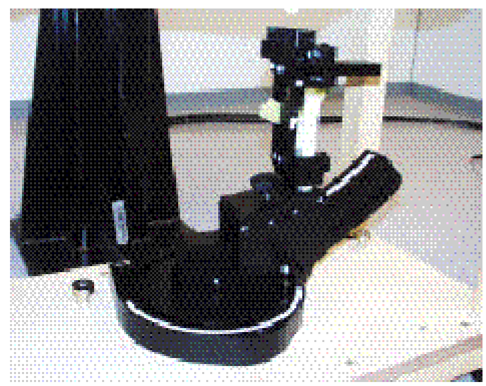


Generic Twin Phantom

Device Holder

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

* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [10]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.



Device Holder

6.3 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the NIS81 [13] and the NIST1297 [14] documents and is given in the following Table.

Uncertainty Description	Error	Distrib.	Weight	Std. Dev.	Offset
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	Rectangle	1	±2.7 %	/
Calibration error	±3.3 %	Normal	1	± 3.3 %	/
SAR Evaluation Uncertainty					
Data acquisition error	±1%	Rectangle	1	±0.6 %	/
ELF and RF disturbances	±0.25 %	Normal	1	±0.25 %	/
Conductivity assessment	±10 %	Rectangle	1	± 5.8 %	/
Spatial Peak SAR Evaluation Uncertainty					
Extrapol boundary effect	±3%	Normal	1	±3%	± 5%
Probe positioning error	±0.1 mm	Normal	1	± 1%	/
Integrat. and cube orient	±3%	Normal	1	±3%	/
Cube shape inaccuracies	±2%	Rectangle	1	±1.2 %	/
Device positioning	±6%	Normal	1	± 6%	/
Combined Uncertainties	/	/	1	±11.7 %	± 5%
Extended uncertainty (K = 2)	/	/	/	± 23.5 %.	/

7 - SYSTEM EVALUATION

7.1 Simulated Tissue Liquid Parameter Confirmation

The dielectric parameters were checked prior to assessment using the HP85070A dielectric probe kit. The dielectric parameters measured are reported in each correspondent section:

7.2 Evaluation Procedures

Maximum Search

The maximum search is automatically performed after each coarse scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacings. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations.

Extrapolation

The extrapolation can be used in z-axis scans with automatic surface detection. The SAR values can be extrapolated to the inner phantom surface. The extrapolation distance is the sum of the probe sensor offset, the surface detection distance and the grid offset. The extrapolation is based on fourth order polynomal functions. The extrapolation is only available for SAR values.

Boundary Corrections

The correction of the probe boundary effect in the vicinity of the phantom surface can be done in two different ways. In the standard (worse case) evaluation, the boundary effect is reduced by different weights for the lowest measured points in the extrapolation routine. The result is a slight overestimation of the extrapolated SAR values (2% to 8%) depending on the SAR distribution and gradient. The advanced evaluation makes a full compensation of the boundary effect before doing the extrapolation. This is only possible of probes with specifications on the boundary effect.

Peak Search for 1g and 10g cube averaged SAR

The 1g and 10g peak evaluations are only available for the predefined cube 4x4x7 and cube 5x5x7 scans. The routine are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 32x32x35mm contains about 35g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation get all points within the measured volume in a 1mm grid (35000 points). In the last step, a 1g cube is place numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. This last procedure is repeated for a 10g cube. If the highest SAR is found at the edge of the measured volume, the system will issue a warning,: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

7.3 System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

IEEE P1528 recommended reference value

Frequency (MHz)	1 g SAR	10 g SAR	Local SAR at surface (above feed point)	Local SAR at surface (v=2cm offset from feed point)
300	3.0	2.0	4.4	2.1
450	4.9	3.3	7.2	3.2
835	9.5	6.2	14.1	4.9
900	10.8	6.9	16.4	5.4
1450	29.0	16.0	50.2	6.5
1800	38.1	19.8	69.5	6.8
1900	39.7	20.5	72.1	6.6
2000	41.1	21.1	74.6	6.5
2450	52.4	24.0	104.2	7.7
3000	63.8	25.7	140.2	9.5

Validation Dipole SAR Reference Test Result for Body (2450 MHz)

Validation Measurement	SAR @ 0.025W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.025W Input averaged over 10g	SAR @ 1W Input averaged over 10g
Test 1	14.2	56.80	6.33	25.32
Test 2	14.3	57.20	6.34	25.36
Test 3	14.2	56.80	6.33	25.32
Test 4	14.1	56.40	6.32	25.28
Test 5	14.3	57.20	6.33	25.32
Test 6	14.0	56.00	6.31	25.24
Test 7	14.2	56.80	6.33	25.32
Test 8	14.2	56.80	6.33	25.32
Test 9	14.4	57.60	6.34	25.36
Test 10	14.2	56.80	6.32	25.28
Average	14.21	56.84	6.32	25.31

System validation result

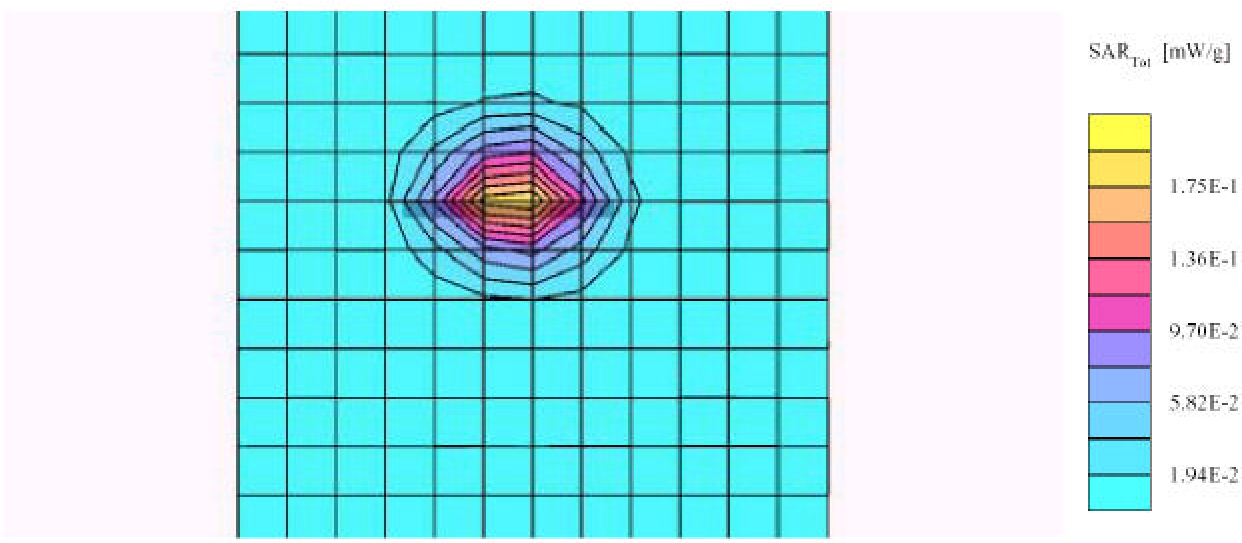
4/19/03:

Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
Body	2450	ε	21	52.7	54.3	3.04	±5
		σ	21	1.95	2.03	4.10	±5
		1g SAR	21	56.84	56.05	-1.39	±10
Head	2450	ε	21	39.2	38.3	-2.30	±5
		σ	21	1.80	1.84	2.22	±5
		1g SAR	21	52.4	51.8	-1.15	±10

ε = relative permittivity, σ = conductivity and ρ=1000kg/m^3
Note: Forward power (for body) = 4.98dBm = 3.14mW
Forward power (for head) = 4dBm = 2.51mW

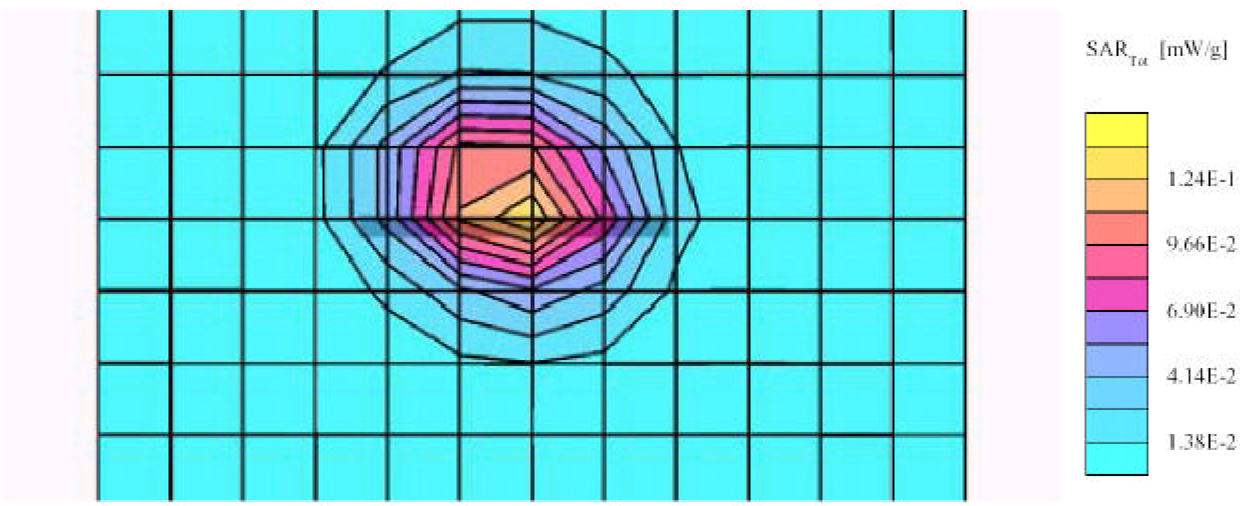
Dipole 2450 MHz (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2450 MHz
Probe: ET3DV6 - SN1604; ConvF(5.68,5.68,5.68); Crest factor: 1.0; 2450 MHz: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.176 mW/g, SAR (10g): 0.0849 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



System Validation for 2450 MHz Head Liquid (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2450 MHz
Probe: ET3DV6 - SN1604; ConvF(5.68,5.68,5.68); Crest factor: 1.0; 2450 MHz: σ = 1.84 mho/m ε_r = 38.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.130 mW/g, SAR (10g): 0.0642 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



7.4 SAR Evaluation Procedure

a. The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For device held to the dear during normal operation, both the left and right ear positions were evaluated in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom. For body-worn and face-held devices a planar phantom was used. The EUT in the test setup for body-worn and face-held devices was placed in three different positions (relative to the phantom): parallel, bystand (perpendicular) and 1.5cm separation.
b. The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm.
c. A 5x5x7 matrix was performed around the greatest special SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.
d. The depth of the simulating tissue in the planar used for the SAR evaluation and system validation was no less than 15.0cm.
e. For this particular evaluation, a stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.
f. Re-measurement of the SAR value at the same location as in a. If the value changed by more than 5%, the evaluation was repeated.

7.5 Exposure Limits

Table 1: Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands. Wrists. Feet and Ankles
0.4	8.0	20.0

Table 2: Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands. Wrists. Feet and Ankles
0.08	1.6	4.0

Note: Whole-body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube SAR for hands, writs, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

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

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

Population/uncontrolled environments Partial-body limit 1.6W/kg applied to the EUT.

8 - TEST RESULTS

This page summarizes the results of the performed dosimetric evaluation. The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device could be found in the following pages.

According to the data in section 6.1, the EUT complied with the FCC 2.1093 RF Exposure standards, with worst case of **0.678**.

8.1 SAR Body-Worn Test Data

Ambient Temperature (ºC): 23.0
Relative Humidity (%): 49.3

Worst case SAR reading

Antenna	Antenna Position	EUT Position	Ch (MHz)	Conducted Power (dBm)	Worst case SAR, averaged over 1g [mW/g]			
					Setup condition (applicable checked)		Measured	Limit
					Antenna	Phantom		
BY27	Right	1.5cm Separation with Phantom	2437	16.37	Built-in	Flat	0.678	1.6
		Bottom Touch Phatom	2437	16.37			0.0177	1.6
		Perpendicular to Phantom	2437	16.37			0.125	1.6
	Left	1.5cm Separation with Phantom	2437	16.37			0.303	1.6
		Bottom Touch Phatom	2437	16.37			0.0745	1.6
		Perpendicular to Phantom	2437	16.37			0.0045	1.6
ZG1S	Right	1.5cm Separation with Phantom	2437	16.53			0.127	1.6
		Bottom Touch Phatom	2437	16.53			0.0117	1.6
		Perpendicular to Phantom	2437	16.53			0.0043	1.6
	Left	1.5cm Separation with Phantom	2437	16.37			0.0216	1.6
		Bottom Touch Phatom	2437	16.37			0.466	1.6
		Perpendicular to Phantom	2437	16.37			0.0190	1.6
ZI1S	Right	1.5cm Separation with Phantom	2437	16.37			0.163	1.6
		Bottom Touch Phatom	2437	16.37			0.0052	1.6
		Perpendicular to Phantom	2437	16.37			0.0038	1.6
	Left	1.5cm Separation with Phantom	2437	16.53			0.0571	1.6
		Bottom Touch Phatom	2437	16.53			0.133	1.6
		Perpendicular to Phantom	2437	16.53			0.0298	1.6

8.2 Plots of Test Result

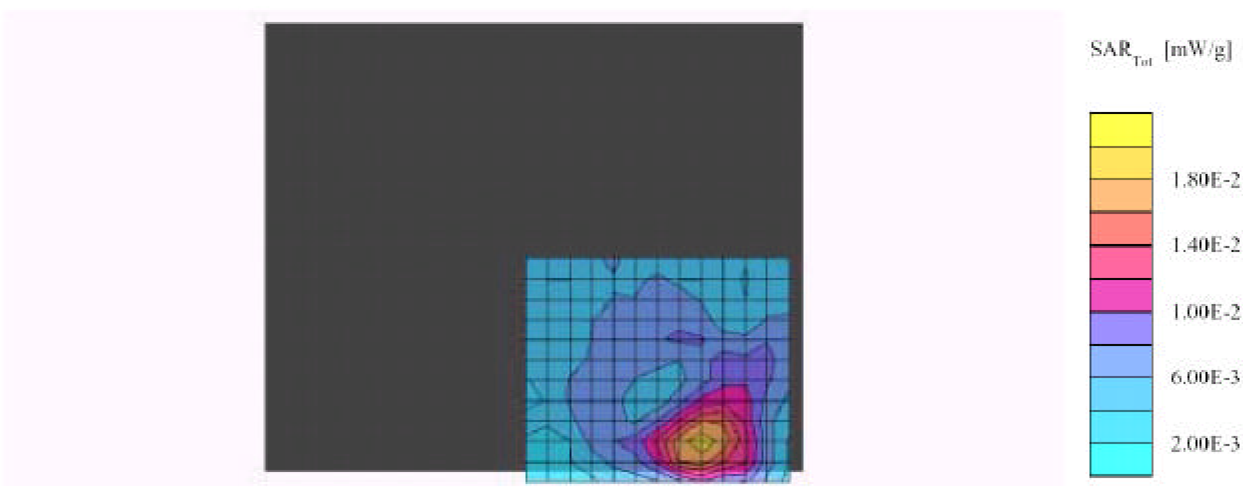
The plots of test result were attached as reference.

Ambit. T60H677 (1.5 cm separation to flat phantom, Antenna position: right side for BY27, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ET3DV6 - SN1604; ConvF(4.30,4.30,4.30); Crest factor: 1.0; 2450: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.678 mW/g, SAR (10g): 0.627 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 13.0, Dz = 10.0
Powerdrift: -0.04 dB

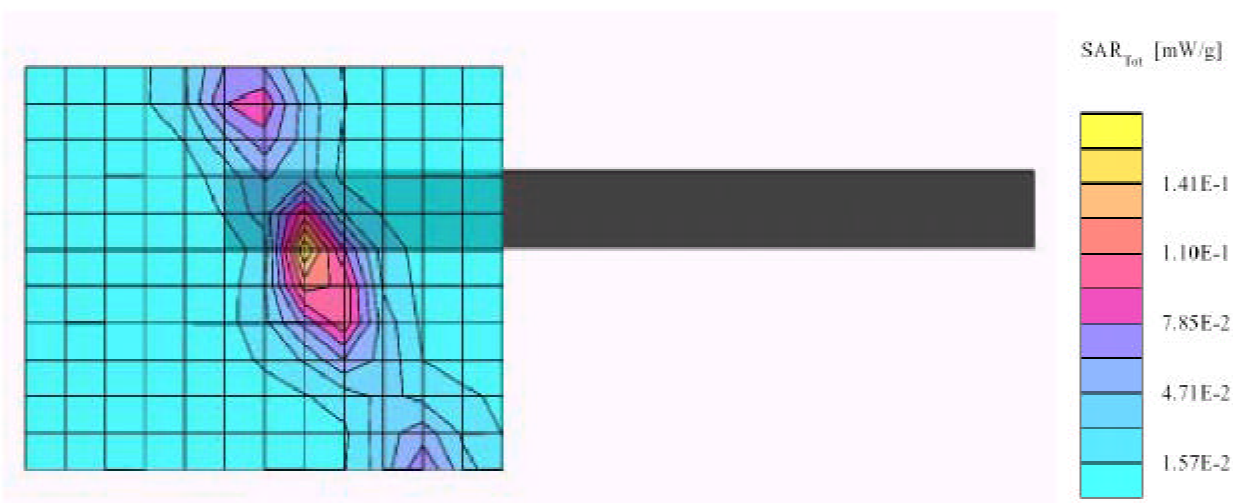
Ambit, T60H677 (Back touching to flat phantom, Antenna position: right side for BY27, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom: Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ET3DV6 - SN1604; ConvF(4.30,4.30,4.30); Crest factor: 1.0; 2450: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.0177 mW/g, SAR (10g): 0.0113 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 13.0, Dz = 10.0
Powerdrift: 0.05 dB



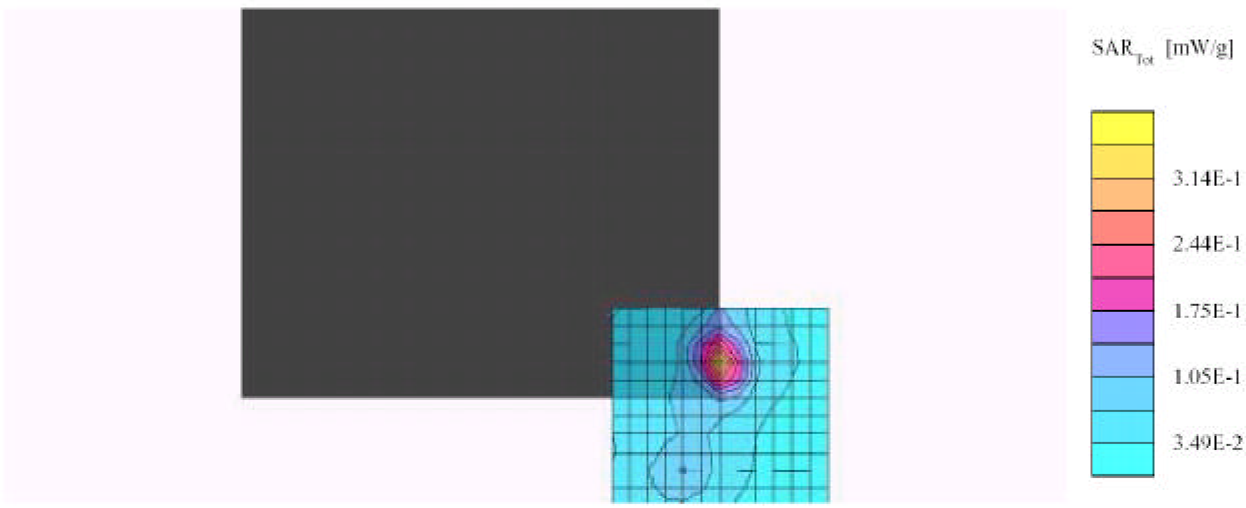
Ambit. T60H677 (Perpendicular to flat phantom, Antenna position: right side for BY27, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (270°,180°); Frequency: 2437 MHz
Probe: ET3DV6 - SN1604; ConvF(4.30,4.30,4.30); Crest factor: 1.0; 2450: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.125 mW/g, SAR (10g): 0.0611 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 13.0, Dz = 10.0
Powerdrift: -0.05 dB



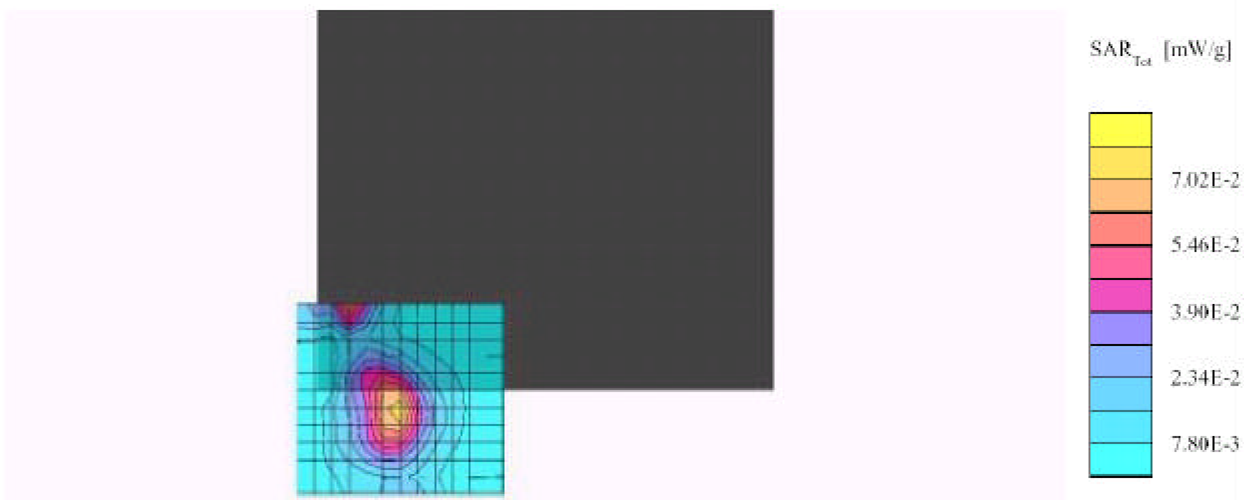
Ambit, T60H677 (1.5 cm separation to flat phantom, Antenna position: Left side for BY2, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ET3DV6 - SN1604; ConvF(4.30,4.30,4.30); Crest factor: 1.0; 2450: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.303 mW/g, SAR (10g): 0.165 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.00 dB



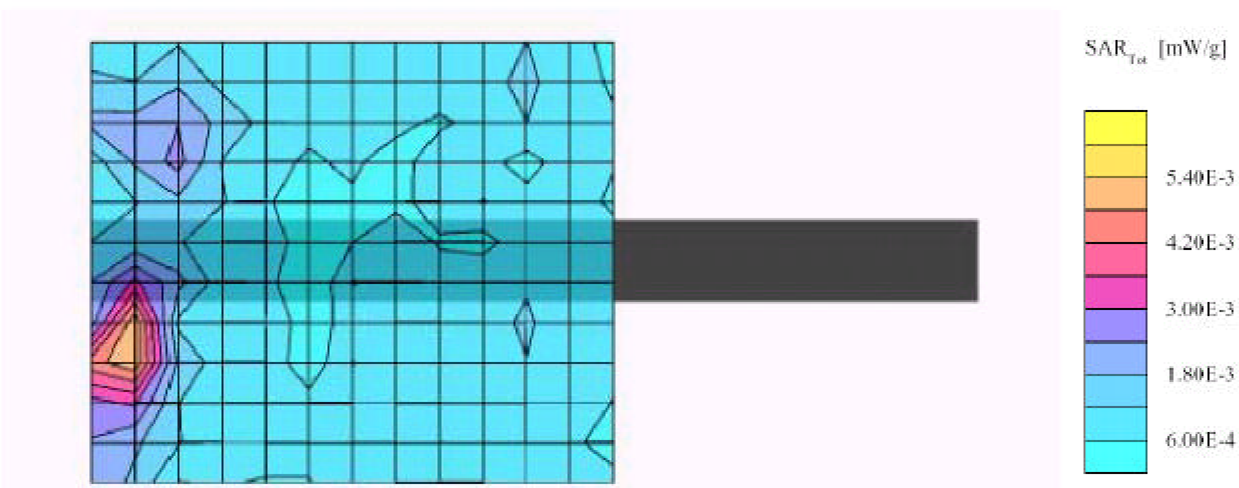
Ambit, T60H677 (Back touching to flat phantom, Antenna position: Left side for BY2, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ET3DV6 - SN1604; ConvF(4.30,4.30,4.30); Crest factor: 1.0; 2450: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.0745 mW/g, SAR (10g): 0.0407 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.04 dB



Ambit, T60H677 (Perpendicular to flat phantom, Antenna position: Left side for BY27, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (270°,180°); Frequency: 2437 MHz
Probe: ET3DV6 - SN1604; ConvF(4.30,4.30,4.30); Crest factor: 1.0; 2450: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.0045 mW/g, SAR (10g): 0.0027 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 13.0, Dz = 10.0
Powerdrift: 0.02 dB



Ambit, T60H677 (1.5 cm separation to flat phantom, Antenna position: right side for ZGIS, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/19/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ET3DV6 - SN1604; ConvF(4.30,4.30,4.30); Crest factor: 1.0; 2450: σ = 2.03 mho/m ε_r = 54.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.127 mW/g, SAR (10g): 0.104 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.04 dB