SAR EVALUATION REPORT

For

SHENZHEN HYT SCIENCE&TECHNOLOGY CO.,LTD

R2-High-Tech Industrial Park
ShenZhen, China

FCC ID: R74TC3000V

This Report Concerns: ☒ Original Report	**Equipment Type:** Transceiver, PTT, Two-way Radio
Test Engineer:	Eric Hong
Report No.:	R0408272S
Report Date:	2004-10-31
Reviewed By:	Daniel Deng
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TABLE OF CONTENTS

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 C95.3-1992 [6] for an uncontrolled environment and 8 mW/g for occupational population (Paragraph 65). According to the Supplement C of OET Bulletin 65 (01-2001) "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 for uncontrolled environment and 8 mW/g for occupational population 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

EUT position	Frequency (MHz)	Conducted Power (W)	Test Type	Antenna Type	Liquid	Phantom	Notes / Accessories	Measured (mW/g)		Limit (mW/g)	Plot #
								100%	50% duty cycle		
back in touch with phantom	160.125	4.65	Body worn	Built-in	body	flat	Belt Clip, Microphone Headset	0.0195	0.00975	8	1
2.5 cm head separation to phantom	160.125	4.65	Face-held	Built-in	head	flat	none	0.0227	0.01135	8	2

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 Equipment List & Calibration Info

Equipment Type	Model	Manufacturer	Serial No.	Cal. Date
Amplifer, Power	2HL-2-8	Mini-Circuits		N/R
Amplifier, Pre	8449B	Agilent	3008A01978	3/8/2004
Amplifier, Pre, microwave	8449B	HP	3008A00277	3/14/2001
Amplifier, RF Power	503L	ENI	285	N/R
Analyzer, Network	8752C	HP	3410A02356	8/11/2002
Analyzer, Spectrum , RF	8566A	HP	2240A01930	N/R
Antenna, Logperiodic		HTM	N/A	N/R
Calibrator, Digital	ST-089	Electronic Digital Caliper	211371	N/R
CDMA MS test set	E6393A	Agilent	JP1MJ00416	3/7/2003
Controller		STAUBLI	F01/5J72A1/A/01	N/R
DASY3 Professional Dosimetric System	DASY3	SPEAG	N/A	N/R
Generator, Signal	8657A	HP	3217A04699	8/23/2002
Generator, Signal	83650B	HP	3614A00276	1/29/2004
Meter, Power	E4419B	Agilent	MY4121511	10/25/2001
Probe, Dielectric Kit	85070A	Agilent	N/A	self
Probe, SPEAG E-Field	ES3DV2	SPEAG	3019	10/9/2003
Robot RX60L	RX60L	SPEAG	F00/5H31A1/A/01	N/R
Sensor, Power	E4412A	Agilent	US384885142	10/17/2002
Sensor, SPEAG Light Alignment	SPEAG Light Alignment Sensor	SPEAG	278	N/R
SPEAG Generic Twin Phantom	SPEAG Generic Twin Phantom	SPEAG	N/A	N/R

2.2 Equipment Calibration Certificate

Please see the attached file.

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

Client Bay Area Comp. Lab (BACL)

CALIBRATION CERTIFICATE

Object(s)	ES3DV2 - SN:3019
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	October 9, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS No. 251-0340	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	In house check: Oct 03
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

	Name	Function	Signature
Calibrated by:	[redacted]		
Approved by:	[redacted]		

Date issued: October 9, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

880-KP0301061-A Page 1 (1)

Schmid & Partner Engineering AG s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ES3DV2

SN: 3019

Manufactured: December 5, 2002
Last calibration: July 12, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Page 1 of 10

ES3DV2 SN: 3019 July 12, 2003

DASY - Parameters of Probe: ES3DV2 SN: 3019

Sensitivity in Free Space

NormX	**1.03** $\mu V/(V/m)^2$
NormY	**1.12** $\mu V/(V/m)^2$
NormZ	**0.98** $\mu V/(V/m)^2$

Diode Compression

DCP X	99
DCP Y	99
DCP Z	99

Sensitivity in Tissue Simulating Liquid

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

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**6.4** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.4** ± 9.5% (k=2)	Alpha	**0.68**
ConvF Z	**6.4** ± 9.5% (k=2)	Depth	**1.11**

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

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**5.0** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.0** ± 9.5% (k=2)	Alpha	**0.21**
ConvF Z	**5.0** ± 9.5% (k=2)	Depth	**2.78**

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR_{be} [%] Without Correction Algorithm	4.3	1.8
SAR_{be} [%] With Correction Algorithm	0.0	0.1

Head 1800 MHz Typical SAR gradient: 10 % per mm

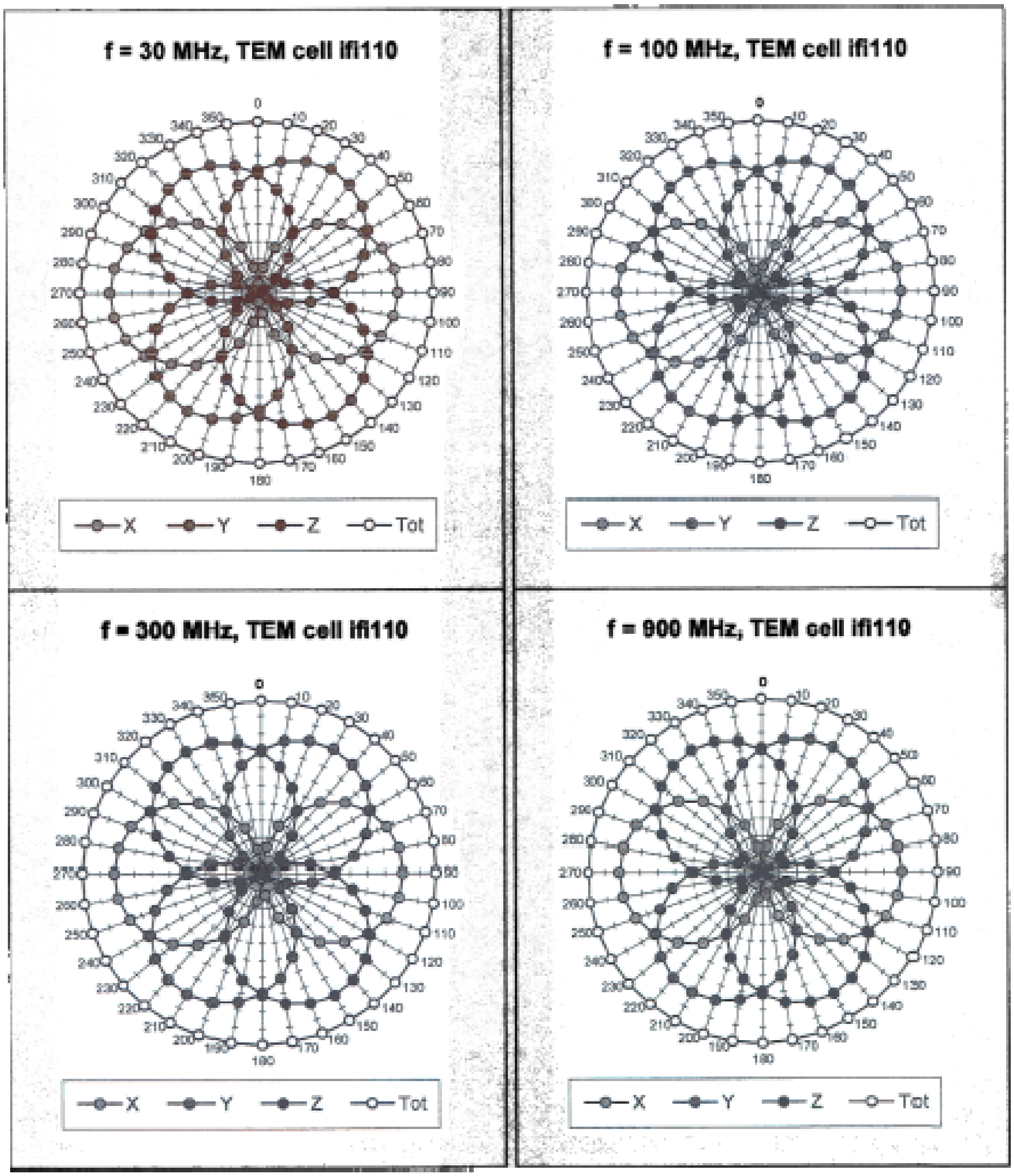
Probe Tip to Boundary	1 mm	2 mm
SAR_{be} [%] Without Correction Algorithm	7.4	5.0
SAR_{be} [%] With Correction Algorithm	0.0	0.1

Sensor Offset

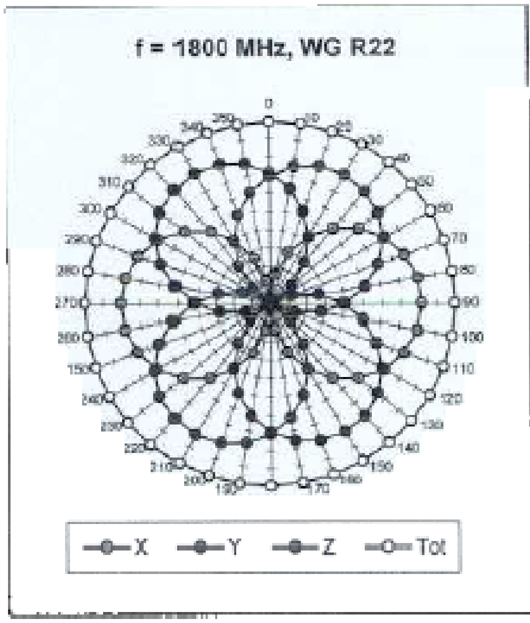
Probe Tip to Sensor Center **2.1** mm

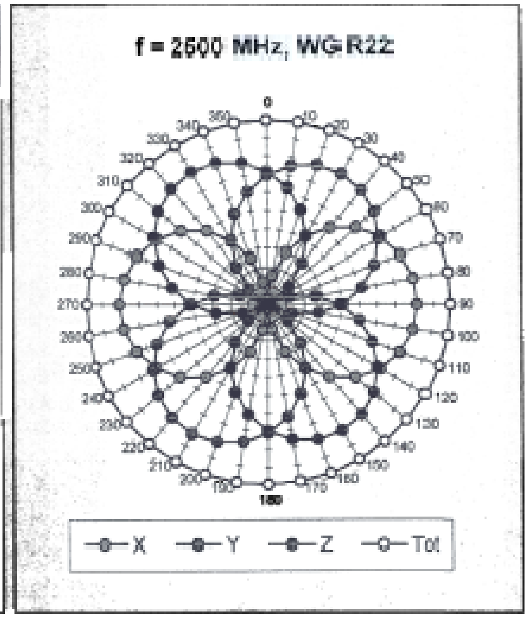
Page 2 of 10

Receiving Pattern (ϕ), θ = 0°

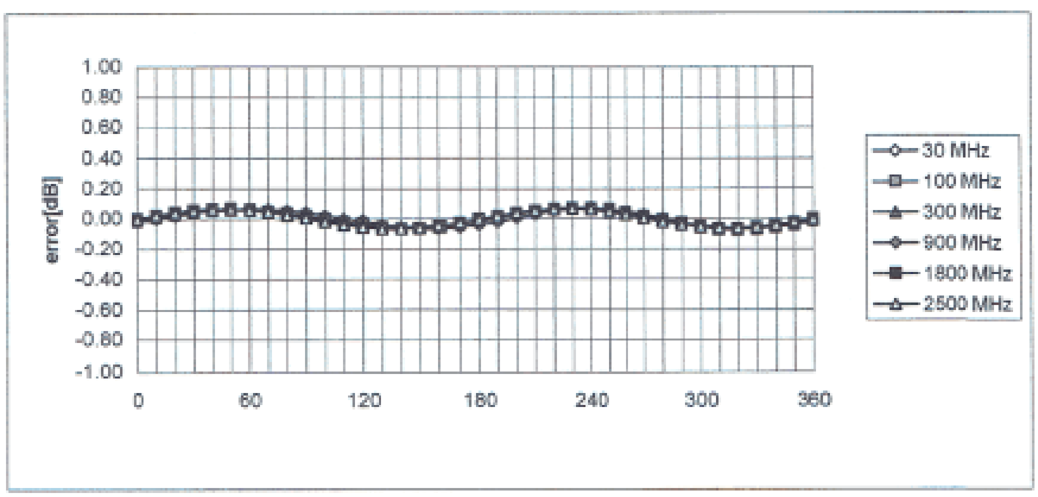


ES3DV2 SN: 3019 July 2003





Isotropy Error (ϕ), θ 0°

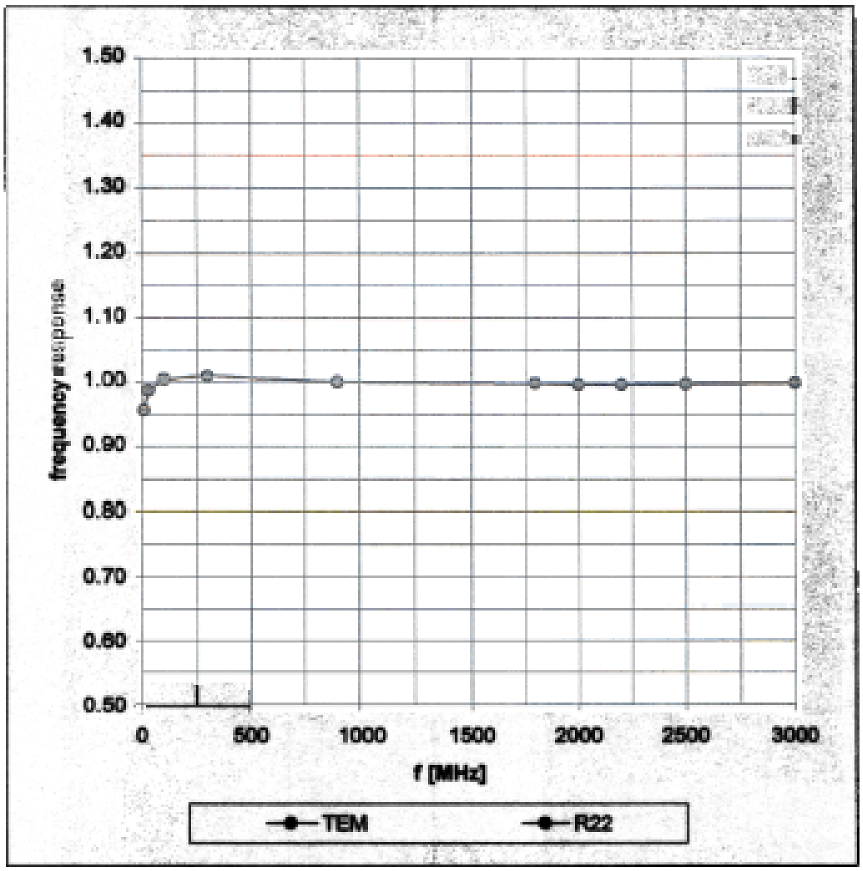


Page

ES3DV2 SN: 3019 July 12, 2003

Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)

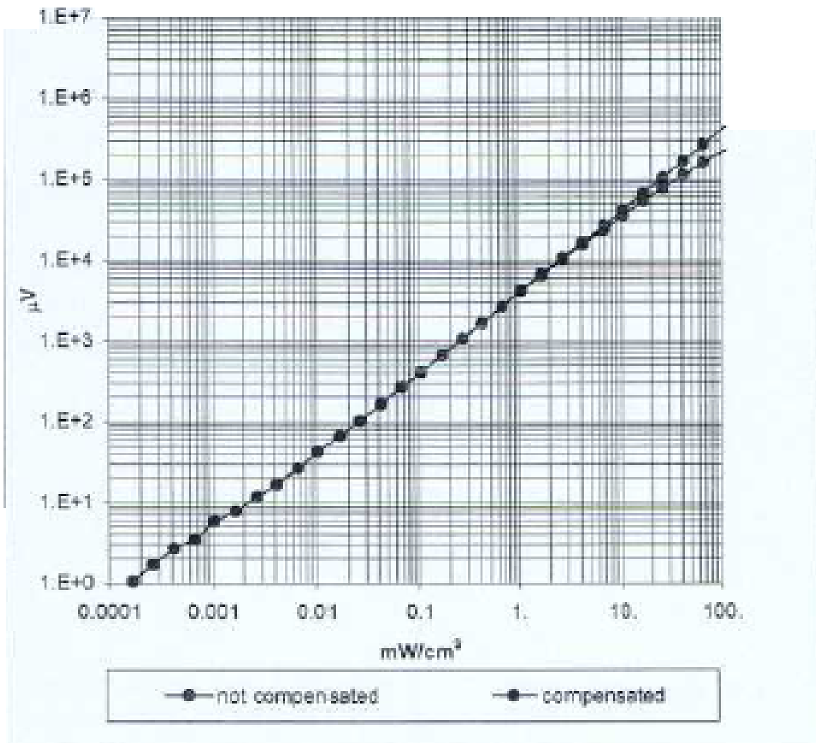


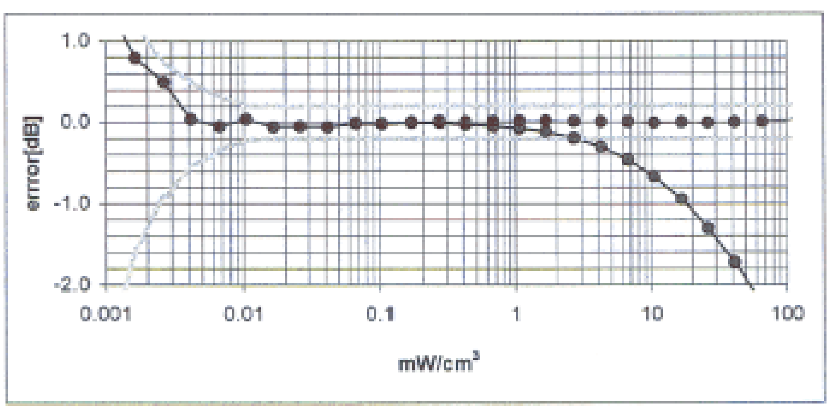
Page 5 of 10

ES3DV2 SN: 3019 **July 12, 2003**

Dynamic Range f(SAR_{brain})

(Waveguide R22)

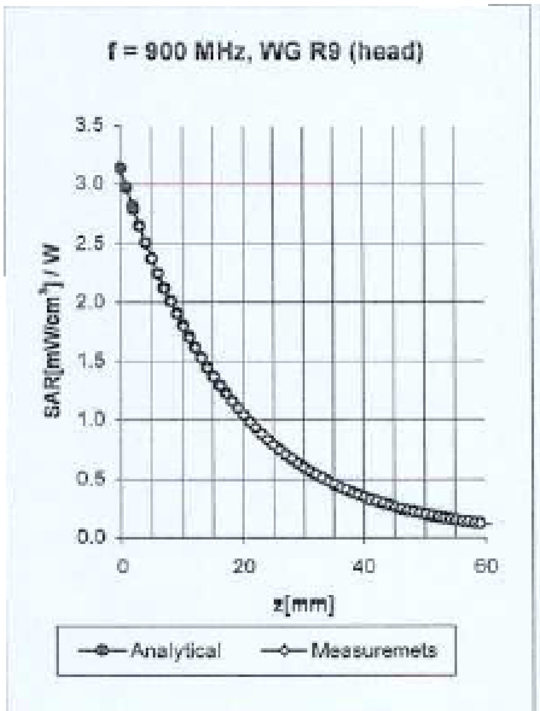


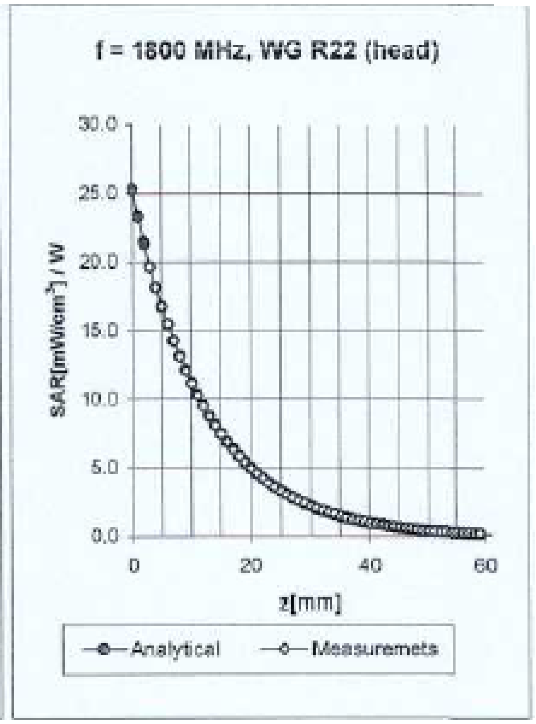


Page 6 of 10

ES3DV2 SN: 3019 **July 12, 2003**

Conversion Factor Assessment





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

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**6.4** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**6.4** ± 9.5% (k=2)		Alpha	**0.68**
ConvF Z	**6.4** ± 9.5% (k=2)		Depth	**1.11**

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

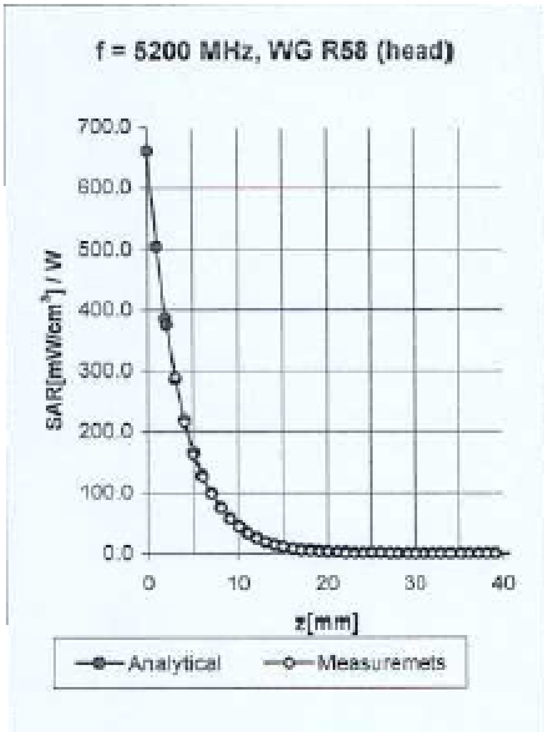
Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

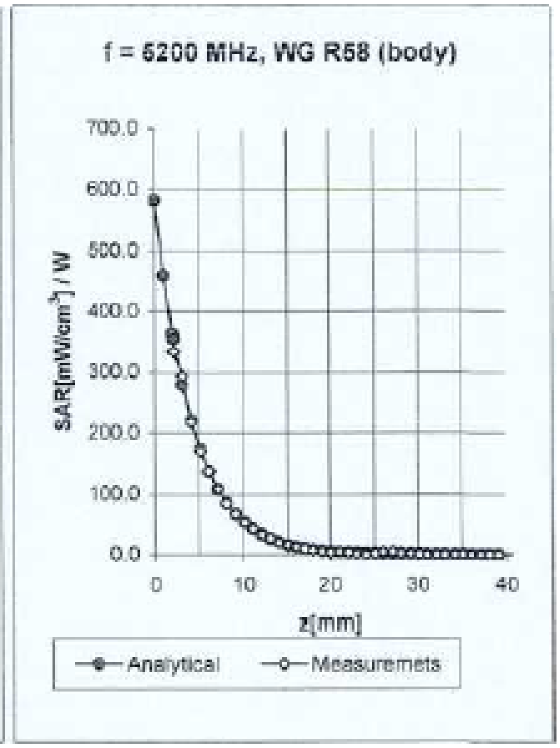
ConvF X	**5.0** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**5.0** ± 9.5% (k=2)		Alpha	**0.21**
ConvF Z	**5.0** ± 9.5% (k=2)		Depth	**2.78**

Page 7 of 10

ES3DV2 SN: 3019 **July 12, 2003**

Conversion Factor Assessment





Head **5200** **MHz** ε_r **= 36.0 ± 5%** **σ = 4.66 ± 5% mho/m**

Valid for f=4940-5460 MHz with Head Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**2.3** ± 14.6% (k=2)	Boundary effect:	
ConvF Y	**2.3** ± 14.6% (k=2)	Alpha	**1.05**
ConvF Z	**2.3** ± 14.6% (k=2)	Depth	**1.50**

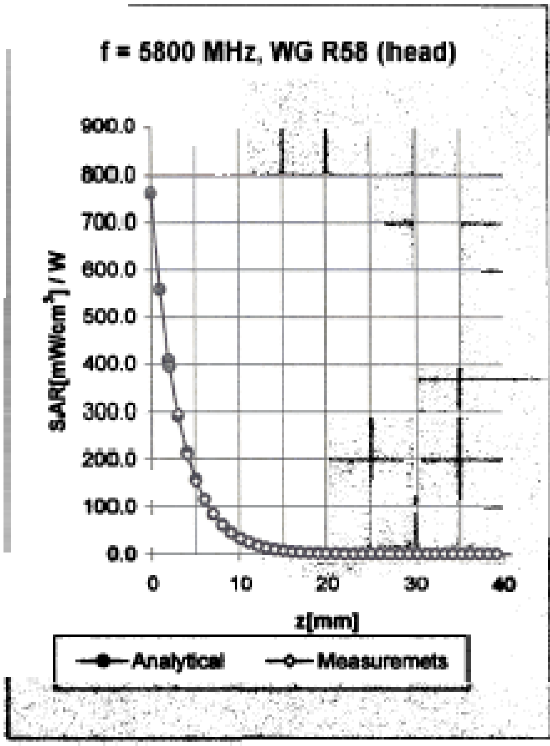
Body **5200** **MHz** ε_r **= 49.0 ± 5%** **σ = 5.30 ± 5% mho/m**

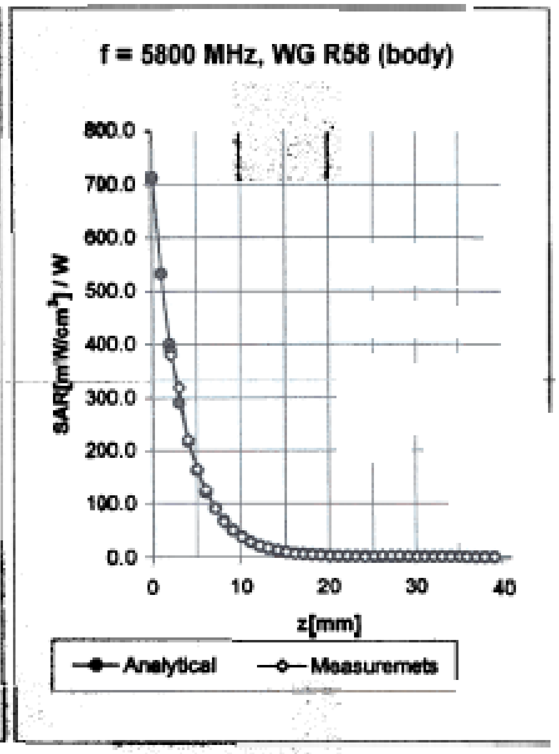
Valid for f=4940-5460 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**1.4** ± 14.6% (k=2)	Boundary effect:	
ConvF Y	**1.4** ± 14.6% (k=2)	Alpha	**1.01**
ConvF Z	**1.4** ± 14.6% (k=2)	Depth	**1.85**

ES3DV2 SN: 3019 July 12, 2003

Conversion Factor Assessment





Head 5800 MHz ε_r = 35.3 ± 5% σ = 5.27 ± 5% mho/m

Valid for f=5510-6090 MHz with Head Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**1.8** ± 14.6% (k=2)		Boundary effect:	
ConvF Y	**1.8** ± 14.6% (k=2)		Alpha	**0.90**
ConvF Z	**1.8** ± 14.6% (k=2)		Depth	**1.90**

Body 5800 MHz ε_r = 48.2 ± 5% σ = 6.00 ± 5% mho/m

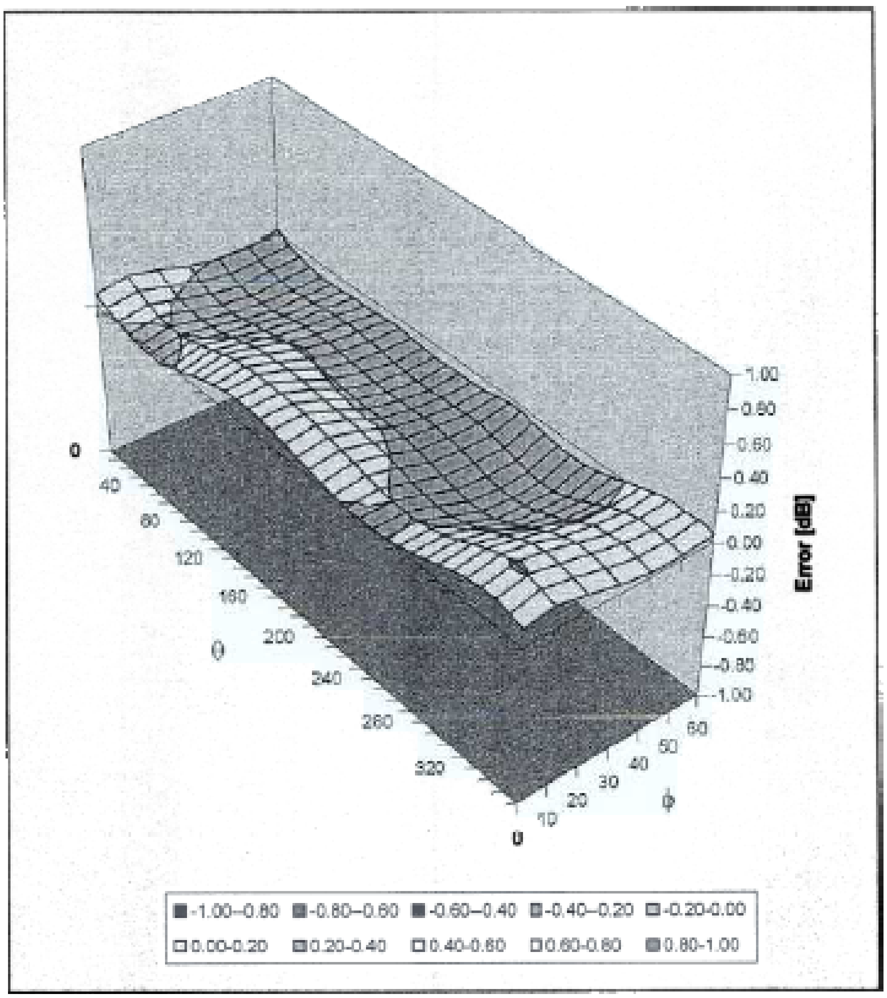
Valid for f=5510-6090 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**1.2** ± 14.6% (k=2)		Boundary effect:	
ConvF Y	**1.2** ± 14.6% (k=2)		Alpha	**1.18**
ConvF Z	**1.2** ± 14.6% (k=2)		Depth	**1.65**

ES3DV2 SN: 3019 **July 12, 2003**

Deviation from Isotropy in HSL

Error (θφ), f = 900 MHz



Page 10 of 10

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ES3DV2

SN:3019

Additional Conversion Factors

Manufactured:	December 5, 2002
Last calibration:	July 12, 2003
Add. calibration:	October 9, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Page 1 of 6

DASY - Parameters of Probe: ES3DV2 SN:3019

Sensitivity in Free Space

NormX	**1.05** $\mu V/(V/m)^2$
NormY	**1.14** $\mu V/(V/m)^2$
NormZ	**0.98** $\mu V/(V/m)^2$

Diode Compression

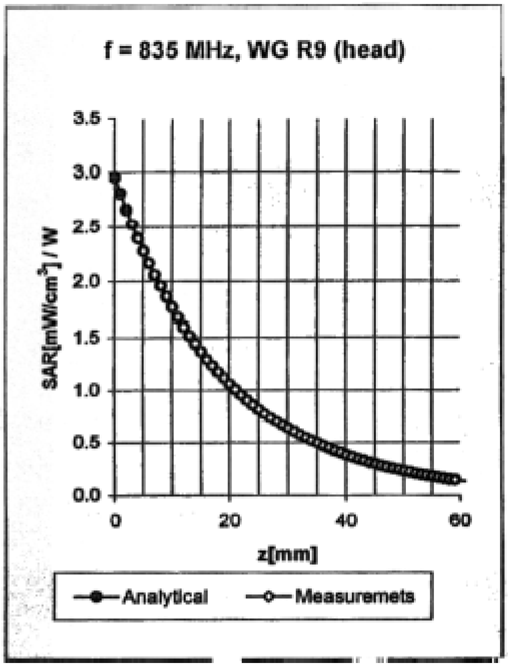
DCP X	**99**
DCP Y	**99**
DCP Z	**99**

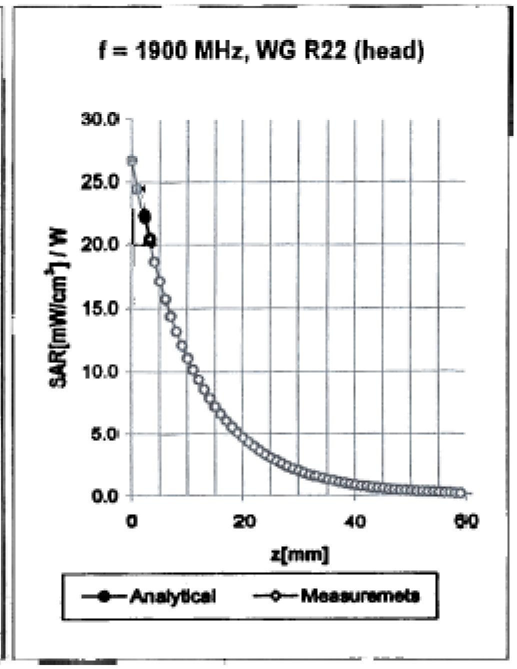
Sensor Offset

Probe Tip to Sensor Center	**2.1**	mm

Page 2 of 6

Conversion Factor Assessment





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

Valid for f=793-877 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**6.5** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.5** ± 9.5% (k=2)	Alpha	**0.35**
ConvF Z	**6.5** ± 9.5% (k=2)	Depth	**1.46**

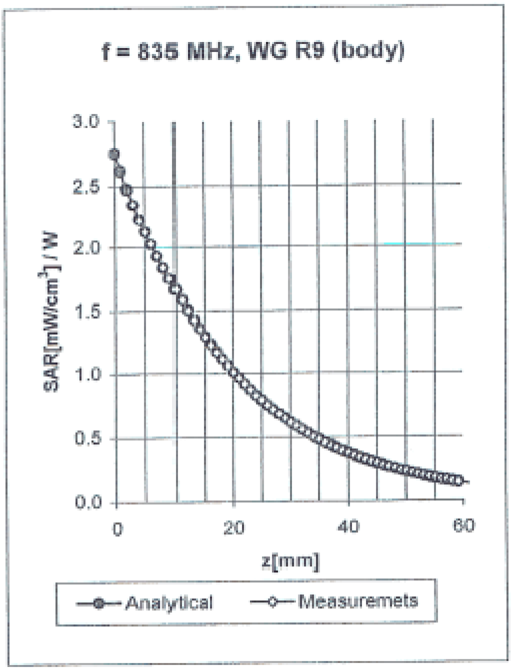
Head **1900 MHz** ε_r **= 40.0 ± 5%** **σ = 1.40 ± 5% mho/m**

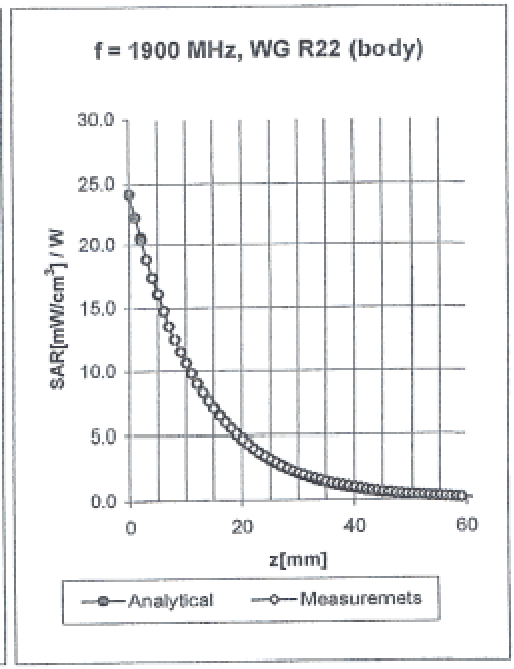
Valid for f=1805-1995 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**4.7** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**4.7** ± 9.5% (k=2)	Alpha	**0.22**
ConvF Z	**4.7** ± 9.5% (k=2)	Depth	**3.48**

Page 3 of 6

Conversion Factor Assessment





Body **835 MHz** **ε_r = 55.2 ± 5%** **σ = 0.97 ± 5% mho/m**

Valid for f=793-877 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	6.1	± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.1	± 9.5% (k=2)	Alpha	0.24
ConvF Z	6.1	± 9.5% (k=2)	Depth	2.00

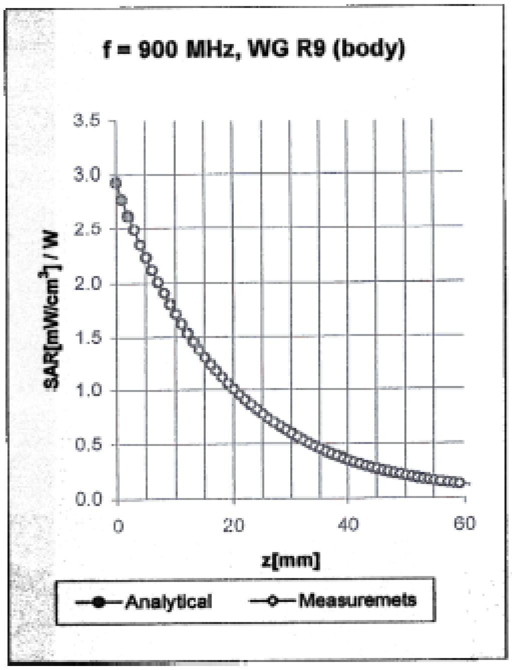
Body **1900 MHz** **ε_r = 53.3 ± 5%** **σ = 1.52 ± 5% mho/m**

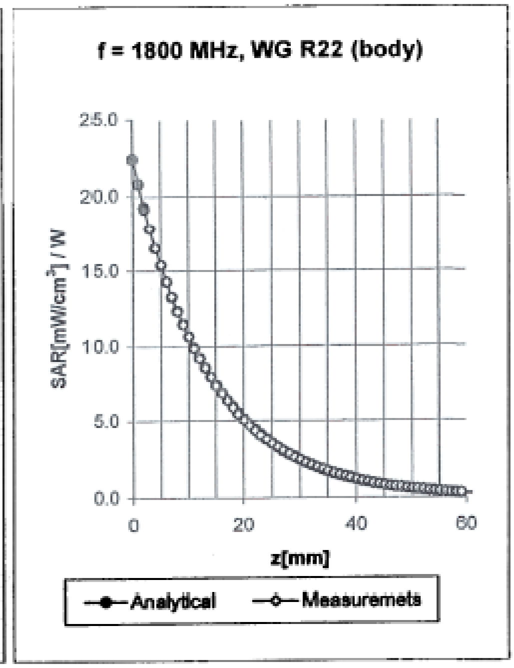
Valid for f=1805-1995 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.6	± 9.5% (k=2)	Boundary effect:	
ConvF Y	4.6	± 9.5% (k=2)	Alpha	0.24
ConvF Z	4.6	± 9.5% (k=2)	Depth	2.64

Page 4 of 6

Conversion Factor Assessment





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

Valid for f=855-945 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

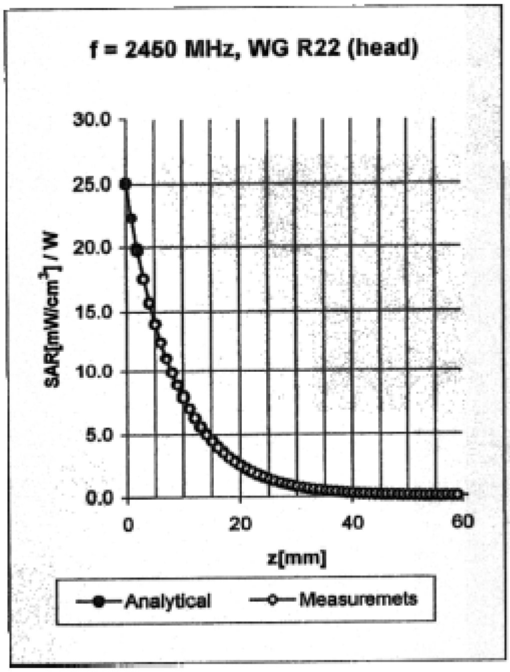
ConvF X	**6.1** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**6.1** ± 9.5% (k=2)		Alpha	**0.27**
ConvF Z	**6.1** ± 9.5% (k=2)		Depth	**1.82**

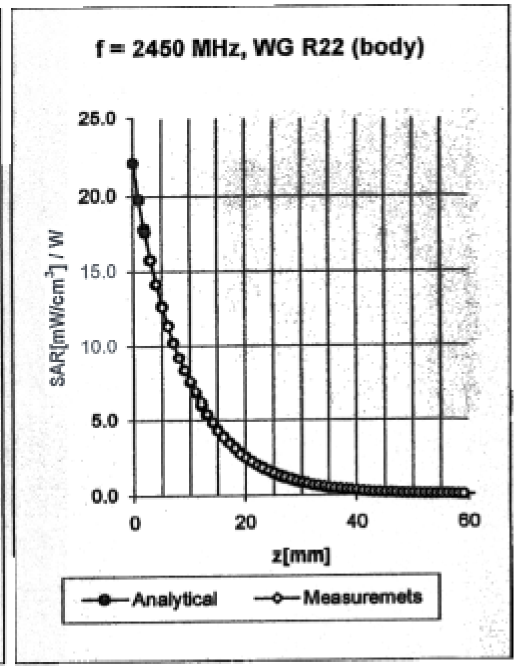
Body **1800 MHz** ε_r = **53.3 ± 5%** σ = **1.52 ± 5% mho/m**

Valid for f=1710-1890 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**4.7** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**4.7** ± 9.5% (k=2)		Alpha	**0.23**
ConvF Z	**4.7** ± 9.5% (k=2)		Depth	**2.99**

Conversion Factor Assessment





Head **2450 MHz** ε_r **= 39.2 ± 5%** **σ = 1.80 ± 5% mho/m**

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**4.5** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**4.5** ± 9.5% (k=2)		Alpha	**0.40**
ConvF Z	**4.5** ± 9.5% (k=2)		Depth	**1.62**

Body **2450 MHz** ε_r **= 52.7 ± 5%** **σ = 1.95 ± 5% mho/m**

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**4.2** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**4.2** ± 9.5% (k=2)		Alpha	**0.32**
ConvF Z	**4.2** ± 9.5% (k=2)		Depth	**1.98**

Page 6 of 6

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Additional Conversion Factors

for Dosimetric E-Field Probe

'ype:	ES3DV2
Serial Number:	**3019**
Place of Assessment:	Zurich
Date of Assessment:	October 13, 2003
Probe Calibration Date:	**October 9, 2003**

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:

ES3DV2-SN:3019 October 13, 2003

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Dosimetric E-Field Probe ES3DV2 SN:3019

Conversion factor (± standard deviation)

150 MHz	ConvF	**8.7 ± 8%**	ε_r = 52.3 ± 5% σ = 0.76 ± 5% mho/m (head tissue)
150 MHz	ConvF	**8.3 ± 8%**	ε_r = 61.9 ± 5% σ = 0.80 ± 5% mho/m (body tissue)
450 MHz	ConvF	**7.4 ± 8%**	ε_r = 43.5 ± 5% σ = 0.87 ± 5% mho/m (head tissue)
450 MHz	ConvF	**7.3 ± 8%**	ε_r = 56.7 ± 5% σ = 0.94 ± 5% mho/m (body tissue)

ES3DV2-SN:3019 **October 13, 2003**

Body 300MHz Liquid Validation, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 09/29/04

Frequency	e'	e''
250000000.0000	60.2748	57.1978
252000000.0000	60.2657	57.4541
254000000.0000	60.1745	57.3472
256000000.0000	60.0521	57.2127
258000000.0000	59.9674	57.3215
260000000.0000	59.8318	57.1421
262000000.0000	59.7429	56.9026
264000000.0000	59.6455	56.8547
266000000.0000	59.5512	56.7541
268000000.0000	59.4625	56.8428
270000000.0000	59.3734	56.4545
272000000.0000	59.2573	56.6736
274000000.0000	59.1408	55.7174
276000000.0000	59.0786	55.3212
278000000.0000	58.9289	54.9661
280000000.0000	58.8502	54.8134
282000000.0000	58.6413	54.5465
284000000.0000	58.5247	54.5159
286000000.0000	58.4518	54.4542
288000000.0000	58.3431	54.3458
290000000.0000	58.2952	54.3212
292000000.0000	58.1680	53.2392
294000000.0000	58.0454	53.1241
296000000.0000	58.0741	53.9875
298000000.0000	57.9351	53.8148
300000000.0000	57.8727	53.7985
302000000.0000	57.7123	54.3114
304000000.0000	57.6141	54.1335
306000000.0000	57.5372	54.2429
308000000.0000	57.5068	54.4547
310000000.0000	57.4956	54.3476
312000000.0000	57.3141	54.2571
314000000.0000	57.2620	54.2347
316000000.0000	56.9142	54.1245
318000000.0000	56.8351	53.9424
320000000.0000	56.7094	53.5212
322000000.0000	56.6123	53.4890
324000000.0000	56.5015	53.3147
326000000.0000	56.4917	53.5101
328000000.0000	56.3054	53.6453
330000000.0000	56.2479	53.7225
332000000.0000	56.3253	53.6110
334000000.0000	56.4265	53.4789
336000000.0000	56.3874	53.5147
338000000.0000	56.4236	53.2845
340000000.0000	56.5347	53.3494
342000000.0000	56.6410	53.1825
344000000.0000	56.7541	53.6883
346000000.0000	56.8149	53.5744
348000000.0000	56.9210	53.7489
350000000.0000	56.8457	53.8552

$\sigma = \omega\, \varepsilon_o\, \varepsilon'' = 2\,\pi f\, \varepsilon_o\, \varepsilon'' = 0.8979$

where $f = 300$

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

$\varepsilon'' = 53.7985$

Head 300MHz Liquid Validation, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 09/29/04

Frequency	e'	e''
250000000.0000	45.5112	52.7447
252000000.0000	45.4325	52.6609
254000000.0000	45.3314	52.6331
256000000.0000	45.2652	52.5548
258000000.0000	45.2768	52.5752
260000000.0000	45.2670	52.5834
262000000.0000	45.1439	51.4578
264000000.0000	45.2301	51.4312
266000000.0000	45.1880	51.3337
268000000.0000	45.2495	51.2756
270000000.0000	45.2732	51.3479
272000000.0000	45.2114	51.2381
274000000.0000	45.2430	51.1332
276000000.0000	45.1289	51.1225
278000000.0000	45.3198	51.0321
280000000.0000	45.4301	50.9447
282000000.0000	45.5524	50.8378
284000000.0000	45.5617	50.7321
286000000.0000	45.6456	50.6542
288000000.0000	45.4514	50.5117
290000000.0000	45.5471	50.4142
292000000.0000	45.6369	50.3478
294000000.0000	45.5455	50.2869
296000000.0000	45.4509	50.3321
298000000.0000	45.5280	50.4867
300000000.0000	45.6547	50.5312
302000000.0000	45.5572	50.5138
304000000.0000	45.4212	50.4246
306000000.0000	45.3084	50.3868
308000000.0000	45.2297	50.2381
310000000.0000	45.2480	50.1174
312000000.0000	45.3252	50.2065
314000000.0000	45.3121	50.1236
316000000.0000	45.4463	50.0974
318000000.0000	45.5545	50.1091
320000000.0000	45.4328	50.0235
322000000.0000	45.3970	50.0640
324000000.0000	45.2214	50.0136
326000000.0000	45.1475	50.0081
328000000.0000	45.0241	50.0224
330000000.0000	45.9448	49.9305
332000000.0000	44.9214	49.8075
334000000.0000	44.8421	49.7252
336000000.0000	44.7485	49.6118
338000000.0000	44.6352	49.5460
340000000.0000	44.5471	49.4351
342000000.0000	44.4897	49.3839
344000000.0000	44.3963	49.2321
346000000.0000	44.2358	49.1072
348000000.0000	44.1471	49.2482
350000000.0000	44.0649	49.3110

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.8433$

where $f = 300$

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

$\varepsilon'' = 50.5312 \times 10^{6}$

Body 150 MHz Liquid Validation, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 09/29/04

Frequency	e'	e''
100000000.0000	76.5637	102.8901
102000000.0000	75.4741	102.3757
104000000.0000	74.3552	102.1169
106000000.0000	73.4210	101.4212
108000000.0000	72.5221	101.3534
110000000.0000	71.4874	100.5729
112000000.0000	71.3958	100.4373
114000000.0000	70.2234	100.1201
116000000.0000	69.1135	99.2913
118000000.0000	69.0279	98.6752
120000000.0000	69.1147	98.8223
122000000.0000	68.9498	98.2145
124000000.0000	67.5325	97.6241
126000000.0000	66.9046	97.3937
128000000.0000	65.3215	97.3215
130000000.0000	64.8127	96.4741
132000000.0000	64.5038	96.3210
134000000.0000	63.8467	95.9457
136000000.0000	63.5553	95.6398
138000000.0000	62.8185	95.2720
140000000.0000	62.3264	95.1632
142000000.0000	61.6302	94.4546
144000000.0000	62.1798	94.4454
146000000.0000	61.2947	93.9041
148000000.0000	61.5436	94.0316
150000000.0000	61.7514	95.2147
152000000.0000	61.5211	96.0544
154000000.0000	59.4120	95.9713
156000000.0000	59.6987	94.5669
158000000.0000	58.9369	93.4157
160000000.0000	58.8447	92.9815
162000000.0000	58.2328	91.8340
164000000.0000	58.0602	90.6362
166000000.0000	57.5501	91.3520
168000000.0000	57.3470	92.0157
170000000.0000	57.1468	91.7475
172000000.0000	56.7351	90.5253
174000000.0000	56.3210	90.1621
176000000.0000	56.2369	89.9473
178000000.0000	55.9702	89.6335
180000000.0000	55.4598	89.5411
182000000.0000	54.9832	89.7205
184000000.0000	54.5147	89.8213
186000000.0000	54.3806	89.5144
188000000.0000	53.9754	89.1734
190000000.0000	53.5693	89.1571
192000000.0000	53.4536	88.6970
194000000.0000	52.8471	88.3645
196000000.0000	52.5212	88.1527
198000000.0000	52.4223	87.7956
200000000.0000	52.2121	87.4907

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.7945$
where $f = 150$
$\varepsilon_o = 8.854 \times 10^{-12}$
$\varepsilon'' = 95.2147 \times 10^{6}$

Head 150 MHz Liquid Validation, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 09/29/04

Frequency	e'	e''
100000000.0000	54.8114	109.4958
102000000.0000	54.2728	108.1479
104000000.0000	54.0998	107.4512
106000000.0000	54.2932	106.9336
108000000.0000	53.6065	105.5725
110000000.0000	53.9682	102.8764
112000000.0000	53.0113	101.9487
114000000.0000	53.1397	100.4901
116000000.0000	53.0326	99.6526
118000000.0000	52.9234	98.2537
120000000.0000	52.5215	97.1169
122000000.0000	52.5721	95.2121
124000000.0000	52.4284	94.5949
126000000.0000	52.0761	93.2412
128000000.0000	52.2219	92.4408
130000000.0000	51.9437	91.3271
132000000.0000	51.4519	90.4978
134000000.0000	51.3272	89.4084
136000000.0000	51.4068	90.2840
138000000.0000	51.5454	92.9498
140000000.0000	51.0849	93.9874
142000000.0000	51.0985	94.0187
144000000.0000	50.8016	95.1933
146000000.0000	51.2768	94.3408
148000000.0000	51.5923	93.7010
150000000.0000	51.6571	92.7541
152000000.0000	51.8412	92.3912
154000000.0000	51.4321	91.8223
156000000.0000	51.5798	91.0764
158000000.0000	51.3467	90.2459
160000000.0000	51.2929	89.6297
162000000.0000	51.1318	88.6470
164000000.0000	50.9812	87.5512
166000000.0000	50.8453	86.2987
168000000.0000	50.7047	86.2321
170000000.0000	50.6969	85.8657
172000000.0000	50.5382	85.1241
174000000.0000	50.4459	84.5798
176000000.0000	50.3028	83.9847
178000000.0000	50.2790	83.2621
180000000.0000	50.1515	82.8130
182000000.0000	50.0794	82.2147
184000000.0000	49.9227	81.7096
186000000.0000	49.8525	81.4821
188000000.0000	49.7316	81.0398
190000000.0000	49.6637	80.5936
192000000.0000	49.5246	79.9751
194000000.0000	49.4678	79.4314
196000000.0000	49.3817	79.1720
198000000.0000	49.2509	78.6796
200000000.0000	49.1878	77.9110

$\sigma = \omega\, \varepsilon_o\, \varepsilon'' = 2\, \pi f\, \varepsilon_o\, \varepsilon''=0.7740$

where $f = 150$

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

$\varepsilon'' = 92.7541 \times 10^{6}$

3 - EUT DESCRIPTION

Serial Number:	04817F0005
Applicant:	SHENZHEN HYT SCIENCE&TECHNOLOGY CO.,LTD
Product Description:	Transceiver, PTT Portable 2-Way Radio
FCC ID:	R74TC3000V
Transmitter Frequency:	145-175 MHz
Maximum Output Power:	4.47 W
Dimension:	58mmL x 32mmW x 280mmH
RF Exposure environment:	Occupational Population
Applicable Standard	FCC CFR 47, Part 90
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. C95.3-2002 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 according to ANSI C63.4-2001.

4.2 EUT Exercise 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 EUT was tested by pushing the PTT bottom during the testing.

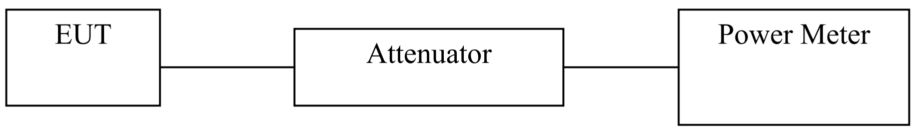
4.3 Equipment Modifications

No modifications were made to the EUT.

5 - CONDUCTED OUTPUT POWER MEASUREMENT

5.1 Measurement Procedure

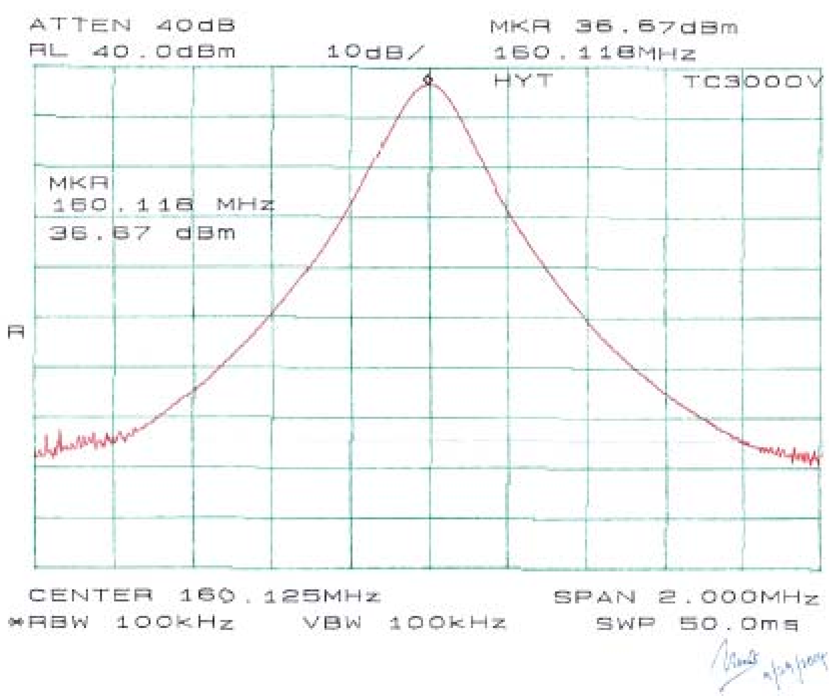
1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.



5.2 Test Results

Channel	Frequency in MHz	Output Power in dBm	Output Power in W
Middle	160.125	36.67	4.65

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



6 - DOSIMETRIC ASSESSMENT SETUP

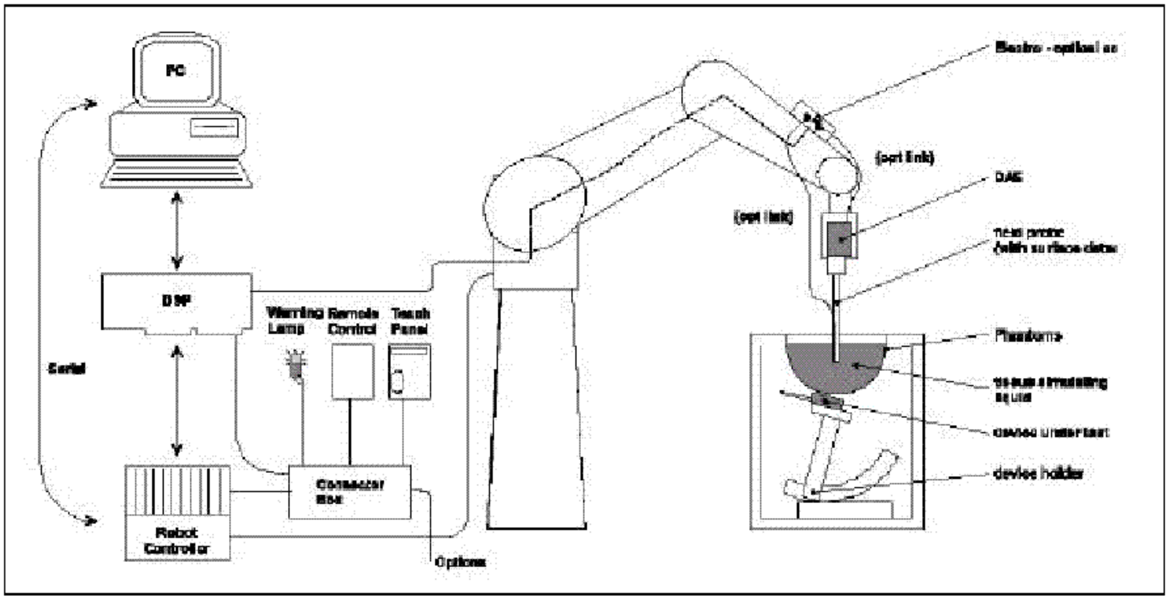
These measurements were performed with the automated near-field scanning system DASY3 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ±0.02mm. Special 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 ET3DV2 SN: 3019 (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 (% by weight)	Frequency (MHz)									
	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	39.8	53.6
Conductivity (s/m)	0.85	0.83	0.91	0.97	1.0	0.98	1.42	1.52	1.88	1.81

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

ES3DV2 Probe Specification

Photograph of the probe

Construction	Symmetrical design with triangular core Interleafed sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycol)
Calibration	In air from 10 MHz to 3 GHz In brain and muscle simulating tissue at frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy ± 8%) Calibratin for other liquids and frequencies upon request
Frequency	10 MHz to > 6GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.3 dB in brain tissue (rotation normal to probe axis)
Dynamic Range	5μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 20 mm Body diameter: 12 mm Tip diameter: 3.9 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 5 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

The SAR measurements were conducted with the dosimetric probe ET3DV2 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 ES3DV2 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	σ
	-Density	ρ

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)
μV/ $(V/m)^2$ 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.

$$SAR = (E_{tot})^2 \cdot \sigma / (\rho \cdot 1000)$$

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

Note that the density is 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.

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

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

Flatphantom V4.4

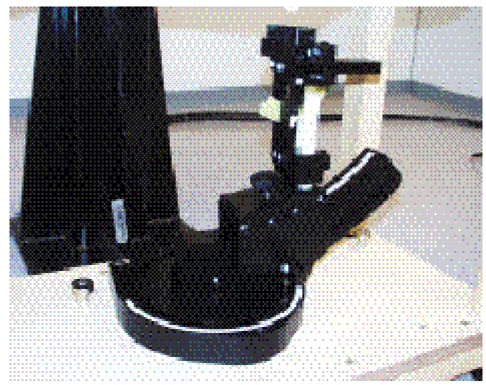
Construction :
Flat phantom for system performance check prior to dosimetric evaluations of body mounted usage for the frequency range 300MHz - 3 GHz. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
Shell Thickness: 6.0 ± 0.2 mm

FLATPHANTOM V4.4

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.

Measurement Uncertainty Analysis per IEEE P1528-2002								
Description	Section	Reported Variance (%)	Probability Distribution type	Divisor	Ci (1g)	Ui (1g)	Vi	welc/satt series term
Probe Calibration	E.2.1	4.80	N	1	1	4.80	1.00E+09	5.30842E-07
Axial isotropy	E.2.2	4.70	R	1.732	0.707107	1.92	1.00E+09	1.35563E-08
Hemispherical isotropy	E.2.2	9.60	R	1.732	0.707107	3.92	1.00E+09	2.35957E-07
Boundary effects	E.2.3	8.30	R	1.732	1	4.79	1.00E+09	5.27377E-07
Linearity	E.2.4	4.70	R	1.732	1	2.71	1.00E+09	5.4225E-08
System Detection Limit	E.2.5	1.00	R	1.732	1	0.58	1.00E+09	1.11124E-10
Readout Electronics	E.2.6	0.00	N	1	1	0.00	1.00E+09	0
Response time	E.2.7	0.00	R	1.732	1	0.00	1.00E+09	0
Integration time	E.2.8	0.00	R	1.732	1	0.00	1.00E+09	0
RF Ambient conditions	E.6.1	3.00	R	1.732	1	1.73	1.00E+09	9.00106E-09
Probe positioning mechanical tolerance	E.6.2	0.40	R	1.732	1	0.23	1.00E+09	2.84478E-12
Probe positioning wrt phantom shell	E.6.3	2.90	R	1.732	1	1.67	1.00E+09	7.8596E-09
Extra/inter-polation & integration algorithmsfor max SAR evaluation	E.5.2	3.90	R	1.732	1	2.25	1.00E+09	2.57079E-08
Test sample positioning	8, E.4.2	6.00	R	1.732	1	3.46	1.00E+09	1.44017E-07
Device holder distance tolerance	E.4.1	5.00	N	1	1	5.00	1.00E+09	0.000000625
Output power and SAR drift measurement	8, E.6.6.2	5.00	R	1.732	1	2.89	1.00E+09	6.94526E-08
Phantom uncertainty, shell thickness tolerance	E.3.1	4.00	R	1.732	1	2.31	1.00E+09	2.84478E-08
Liquid conductivity, deviation from target values	E.3.2	5.00	R	1.732	0.64	1.85	1.00E+09	1.16522E-08
Liquid conductivity, measurement uncertainty	E.3.3	5.00	N	1	0.64	3.20	5	20.97152
Liquid permitivity, deviation from target values	E.3.2	5.00	R	1.732	0.6	1.73	1.00E+09	9.00106E-09
Liquid permitivity, measurement uncertainty	E.3.3	5.00	N	1	0.6	3.00	5	16.2
								689
Probe isotropy sensitivity coefficient	**0.5**							
Combined Standard Uncertainty						**12.65**	**%**	
Expanded Uncertainty, 95% confidence		**k=**	**2.004**			**25.34**	**%**	

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 (300 MHz)

Validation Measurement	SAR @ 100 mW Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 100 mW Input averaged over 10g	SAR @ 1W Input averaged over 10g
Test 1	0.376	3.76	0.255	2.55
Test 2	0.378	3.78	0.256	2.56
Test 3	0.380	3.80	0.258	2.58
Test 4	0.385	3.85	0.261	2.61
Test 5	0.384	3.84	0.261	2.61
Test 6	0.383	3.83	0.261	2.61
Test 7	0.382	3.82	0.260	2.60
Test 8	0.381	3.81	0.259	2.59
Test 9	0.379	3.79	0.258	2.58
Test 10	0.379	3.79	0.257	2.57
Average	0.381	3.81	0.259	2.59

System validation result

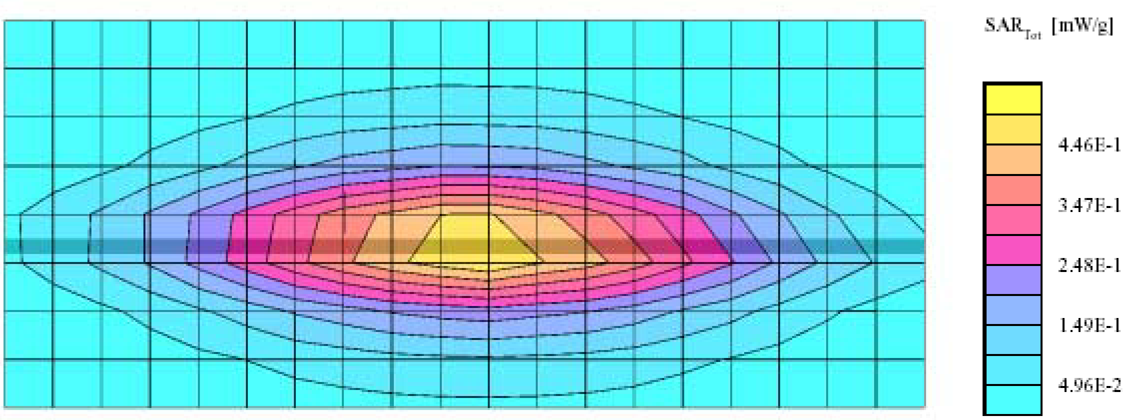
2004-09-29
Ambient Temperature (ºC): 23.0
Relative Humidity (%): 49.3

Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
Body	300	ε	22	58.2	57.9	-0.52	±5
		σ	22	0.92	0.90	-2.17	±5
		1g SAR	22	3.81	3.81	0.00	±10
Head	300	ε	22	45.3	45.7	0.88	±5
		σ	22	0.87	0.84	-3.45	±5
		1g SAR	22	3.00	3.00	0.00	±10

ε = relative permittivity, σ = conductivity and ρ=1000kg/m^3
Note: Forward power for Body = 20.61 dBm = 115.08 mW
Forward power for Head = 20.59 dBm = 114.55 mW

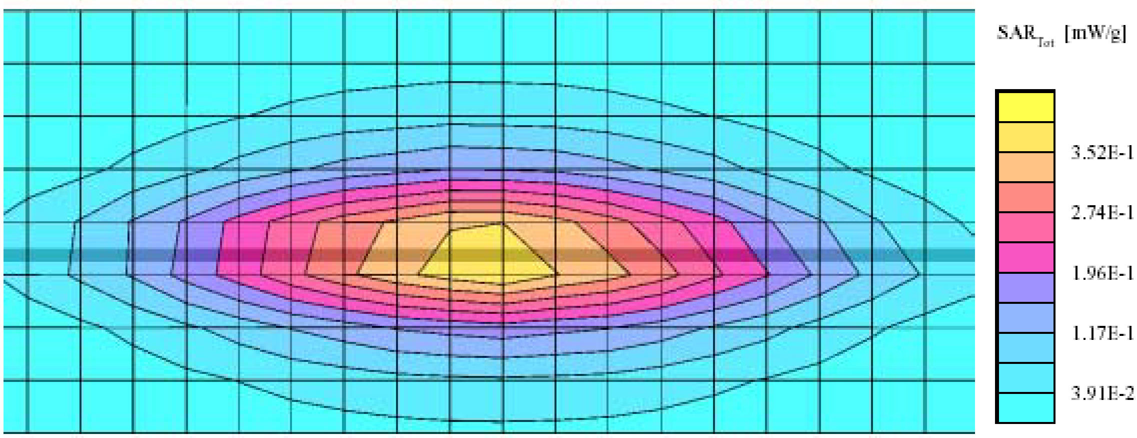
300 MHz Body Liquid System Validation (Ambient Temp = 21 Deg C, Liquid Temp = 22 Deg C, Forward Power = 20.61 dBm, 9/29/2004)

Flat Phantom v4.4 Phantom; Flat Section; Position: (90°,90°); Frequency: 300 MHz
Probe: ES3DV2 - SN3019; ConvF(7.54,7.54,7.54); Crest factor: 1.0; Body liquid 300 MHz: σ = 0.90 mho/m ε_r = 57.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.439 mW/g, SAR (10g): 0.300 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.05 dB



300 MHz Head Liquid System Validation (Ambient Temp = 21 Deg C, Liquid Temp = 22 Deg C, Forward Power = 20.59 dBm, 9/29/2004)

Flat Phantom v4.4 Phantom; Flat Section; Position: (90°,90°); Frequency: 300 MHz
Probe: ES3DV2 - SN3019; ConvF(7.81,7.81,7.81); Crest factor: 1.0; Head liquid 300 MHz: σ = 0.84 mho/m ε_r = 45.7 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.344 mW/g, SAR (10g): 0.235 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.03 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): with belt clip, without belt clip and 2.5cm facing left head side and 2.5cm facing right head side.
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).

Occupational/Controlled environments Partial-body limit 8W/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 8.1, the EUT complied with the FCC 2.1093 RF Exposure standards, with worst case of **0.01135 mW/g**.

8.1 SAR Test Data

Ambient Temperature (ºC): 23.0
Relative Humidity (%): 49.3
Flat Phantom Dimension: 1000mm x 500mm

Worst case SAR reading

EUT position	Frequency (MHz)	Conducted Power (W)	Test Type	Antenna Type	Liquid	Phantom	Notes / Accessories	Measured (mW/g)		Limit (mW/g)	Plot #
								100%	50% duty cycle		
back in touch with phantom	160.125	4.65	Body worn	Built-in	body	flat	Belt Clip, Microphone Headset	0.0195	0.00975	8	1
2.5 cm head separation to phantom	160.125	4.65	Face-held	Built-in	head	flat	none	0.0227	0.01135	8	2

8.2 Plots of Test Result

The plots of test result were attached as reference.

HYT, Model number: (Back touching flat phantom with leather case and headset, Mid Channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 9/29/2004)

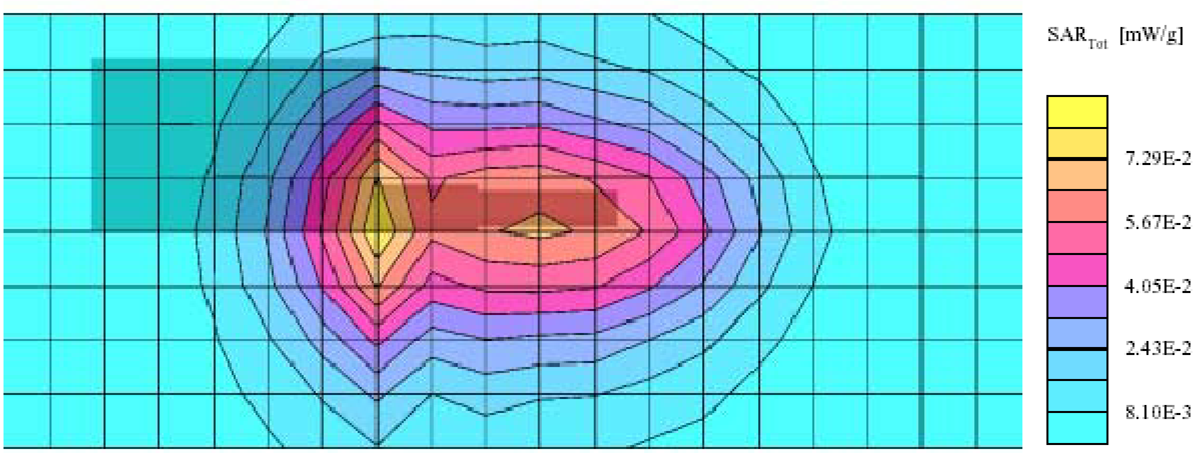
Flat Phantom v4.4 Phantom; Flat Section; Position: (90°,270°); Frequency: 160.125 MHz

Probe: ES3DV2 - SN3019; ConvF(8.30,8.30,8.30); Crest factor: 1.0; Body 150 MHz: σ = 0.79 mho/m ε_r = 61.8 ρ = 1.00 g/cm^3

Cube 5x5x7: SAR (1g): 0.0195 mW/g, SAR (10g): 0.0137 mW/g, (Worst-case extrapolation)

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: 0.03 dB



Plot #1

HYT, Model number: (2.5 cm separation to flat phantom, Mid Channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 9/29/2004)

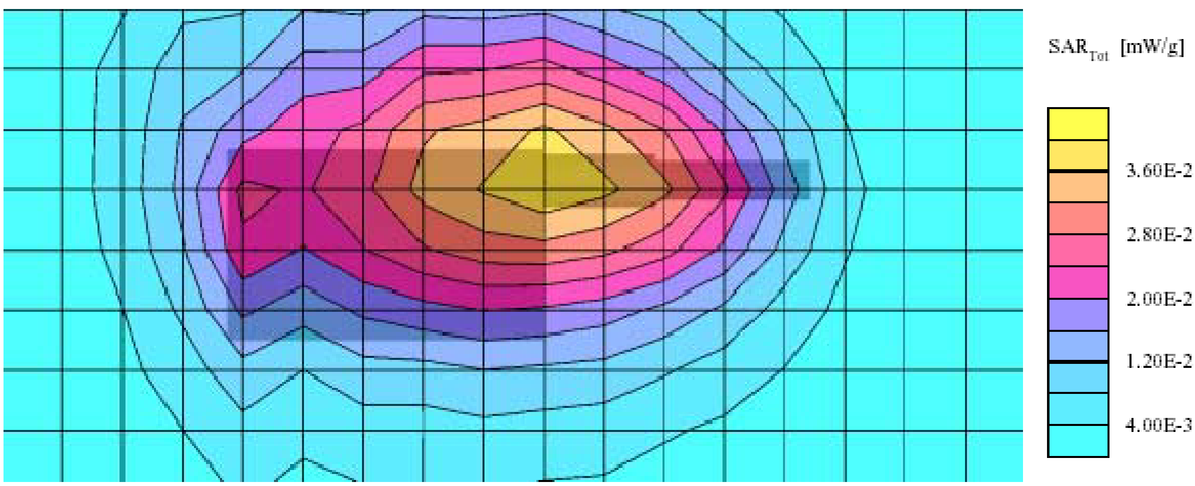
Flat Phantom v4.4 Phantom; Flat Section; Position: (90°,270°); Frequency: 160.125 MHz

Probe: ES3DV2 - SN3019; ConvF(8.70,8.70,8.70); Crest factor: 1.0; Head 150 MHz: σ = 0.77 mho/m ε_r = 51.7 ρ = 1.00 g/cm³

Cube 5x5x7: SAR (1g): 0.0227 mW/g, SAR (10g): 0.0173 mW/g, (Worst-case extrapolation)

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

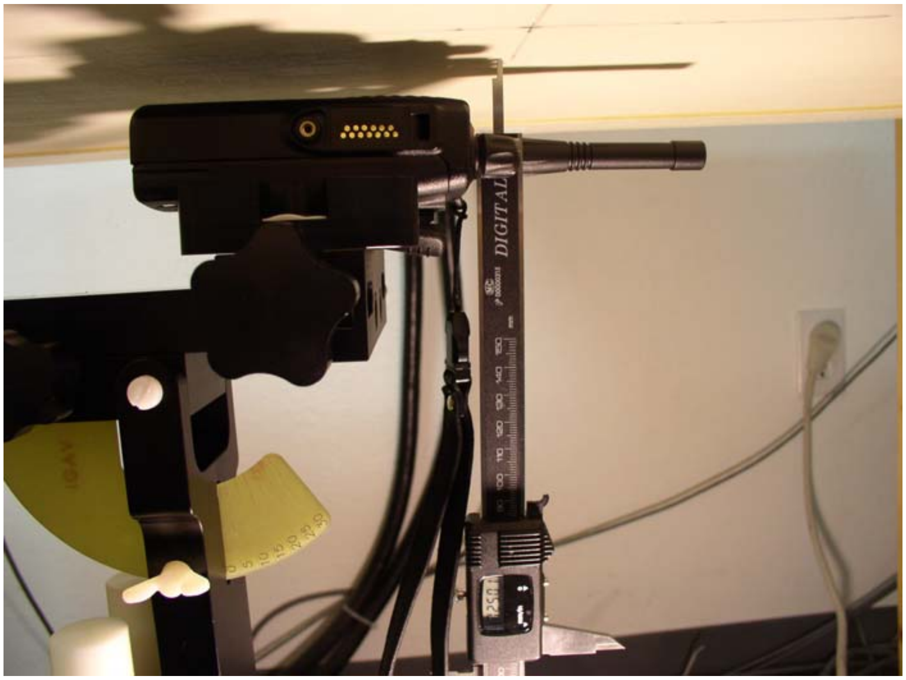
Powerdrift: -0.04 dB



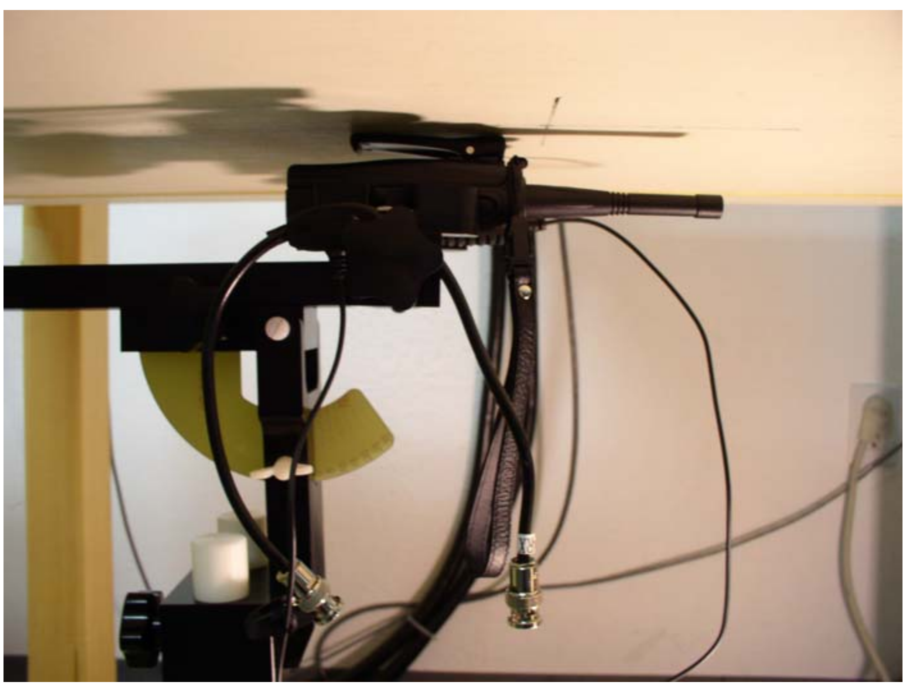
Plot #2

EXHIBIT A - SAR SETUP PHOTOGRAPHS

2.5cm Head Separation to Flat Phantom



Back Touching with Flat Phantom with Belt Clip and Headset



Digital Calibrator (2.5cm)

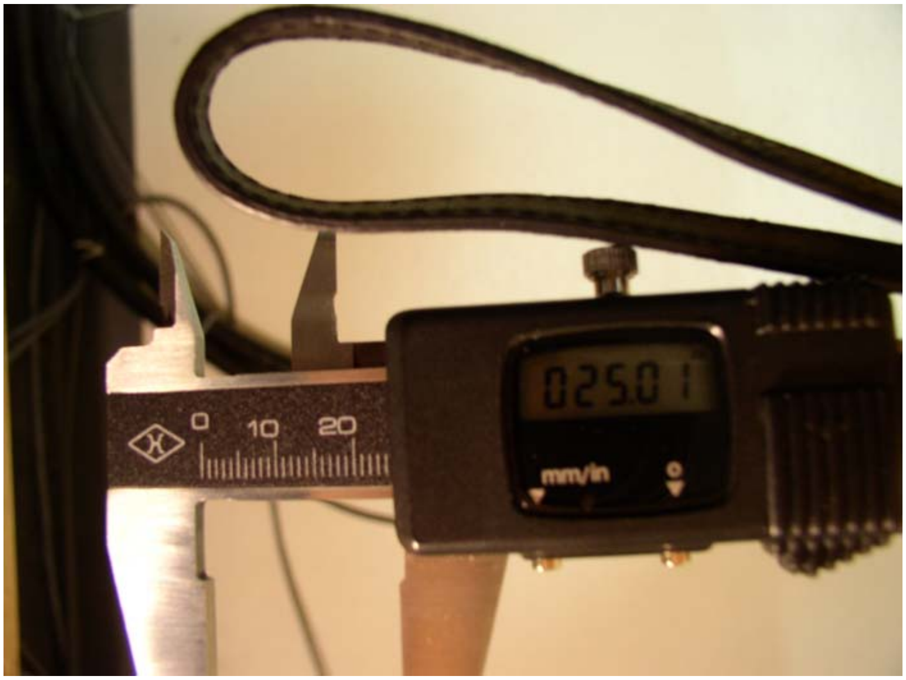


EXHIBIT B - EUT PHOTOGRAPHS

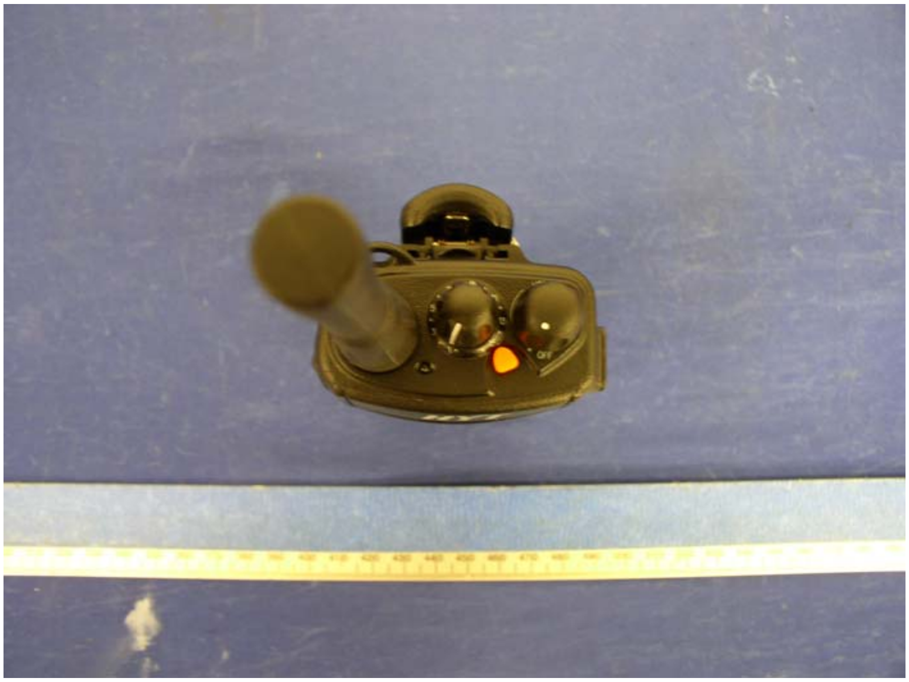
EUT – Front View

EUT – Rear View

EUT – Battery Removed Back View

Antenna View

EUT – Top View

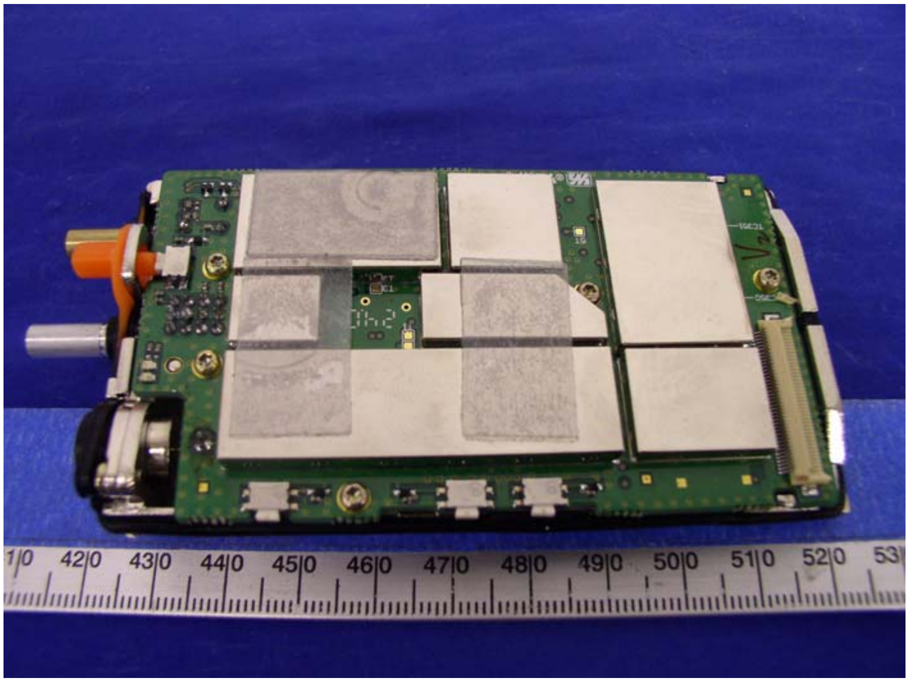


Battery View

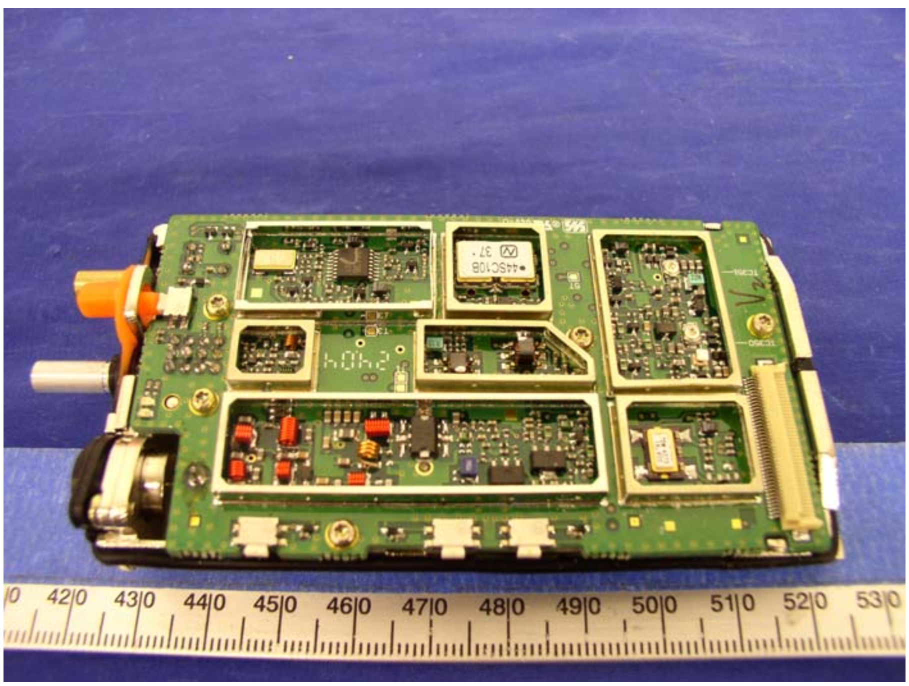
Headset Simulator View

Charger View

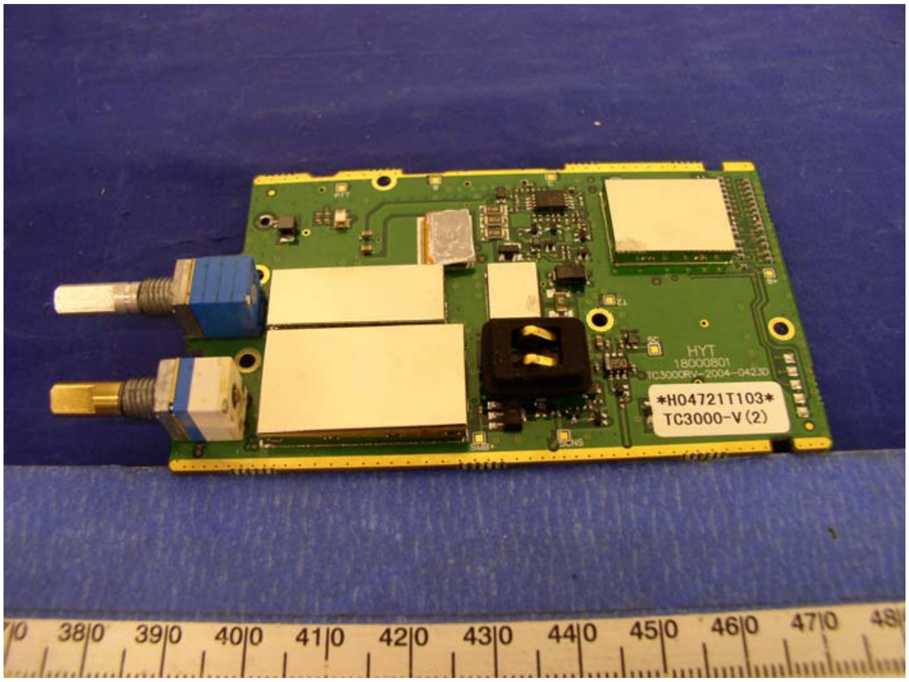
Main Board – Component with Shielding View



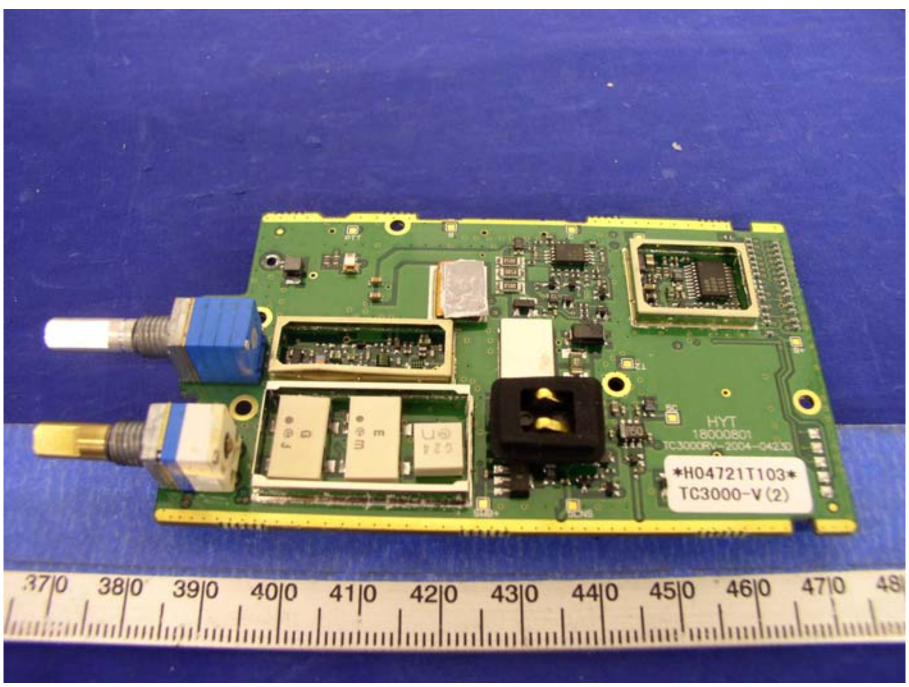
Main Board – Component without Shielding View



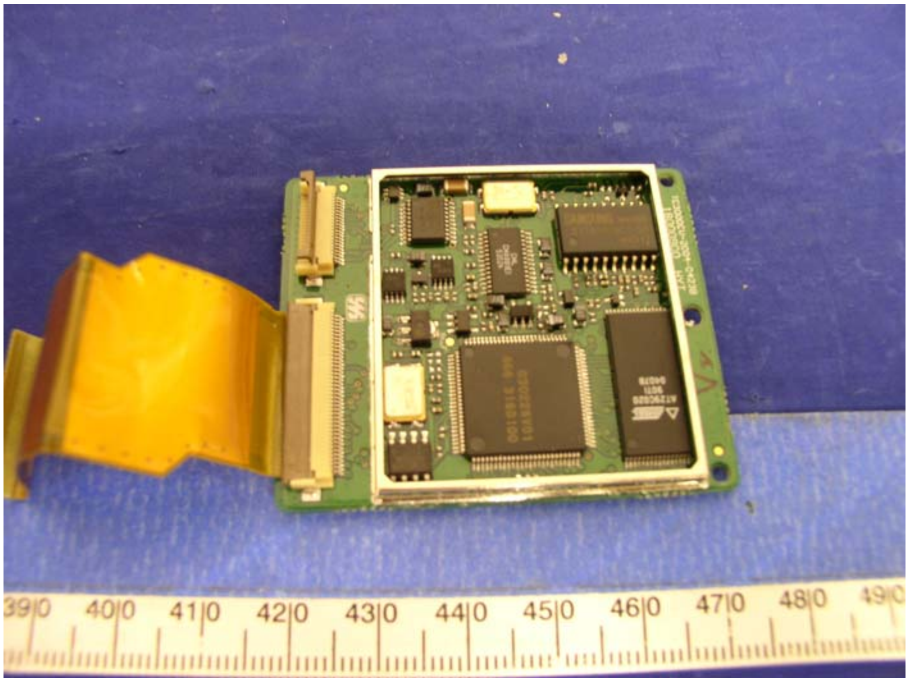
Main Board – Solder with Shielding View



Main Board – Solder without Shielding View



Secondary Board – Component View



Secondary Board – Solder View

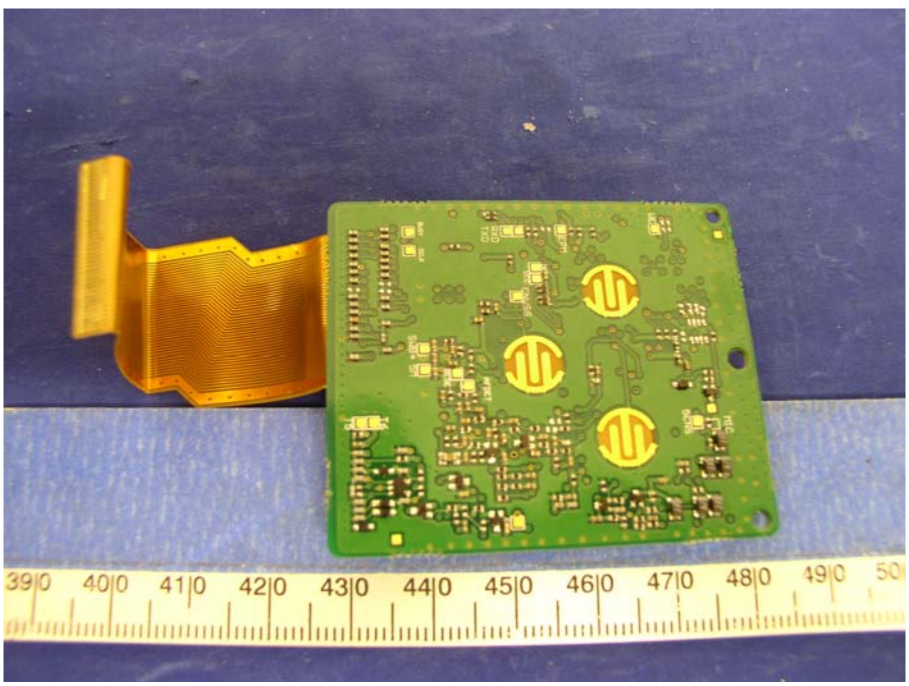


EXHIBIT C – Z-Axis

HYT, Model number: TC 3000 (2.5 cm separation to flat phantom, Mid Channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 2/29/2004)

Flat Phantom v4.4 Phantom; Section; Position: ; Frequency: 163 MHz

Probe: ES3DV2 - SN3019; ConvF(8.70,8.70,8.70); Crest factor: 1.0; Head 150 MHz: σ = 0.77 mho/m ε_r = 51.7 ρ = 1.00 g/cm³

: , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 2.0