SAR EVALUATION REPORT

For

Continental Conair Limited

35/F Standard Chartered Tower
Millennium City, 388 Kwun Tong Road
Kwun Tong, Kowloon, HK

FCC ID: LBBHUM1200

2004-02-02

This Report Concerns: ☒ Original Report	**Equipment Type:** GMRS Radio
Test Engineer:	Eric Hong /
Report No.:	R0401124S
Test Date:	2004-01-013
Reviewed By:	Ling Zhang /
Prepared By:	Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

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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

EUT position	Frequency (MHz)	Output Power (W)	Test Type	Antenna Type	Liquid	Phantom	Notes / Accessories	Measured (mW/g)		Limit (mW/g)	Plot #
								50% duty cycle	100% duty cycle		
Back touching phantom	462.7250	1.8	Body worn	Built-in	body	flat	With belt clip & headset	0.685	1.37	1.6	1
Face 2.5 cm separation from phantom	462.7250	1.8	Face-held	Built-in	head	flat	None	0.555	1.11	1.6	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

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	6/04	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	11/6/04	BCL-049
SPEAG Validation Dipole D900V2	9/3/04	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	6/20/04	3009A00791
Microwave Amp. 8349B	N/A	2644A02662
Power Meter HP436A	4/2/04	2709A29209
Power Sensor HP8482A	4/2/04	2349A08568
Signal Generator RS SMIQ O3	2/10/04	1084800403
Network Analyzer HP-8753ES	7/30/04	820079
Dielectric Probe Kit HP85070A	N/A	N/A
Apprel Validation Dipole D-2450-S-1	10/1/04	BCL-141
Dipole Antenna AD-100 (450MHz)	5/7/04	02220

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.

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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!)

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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

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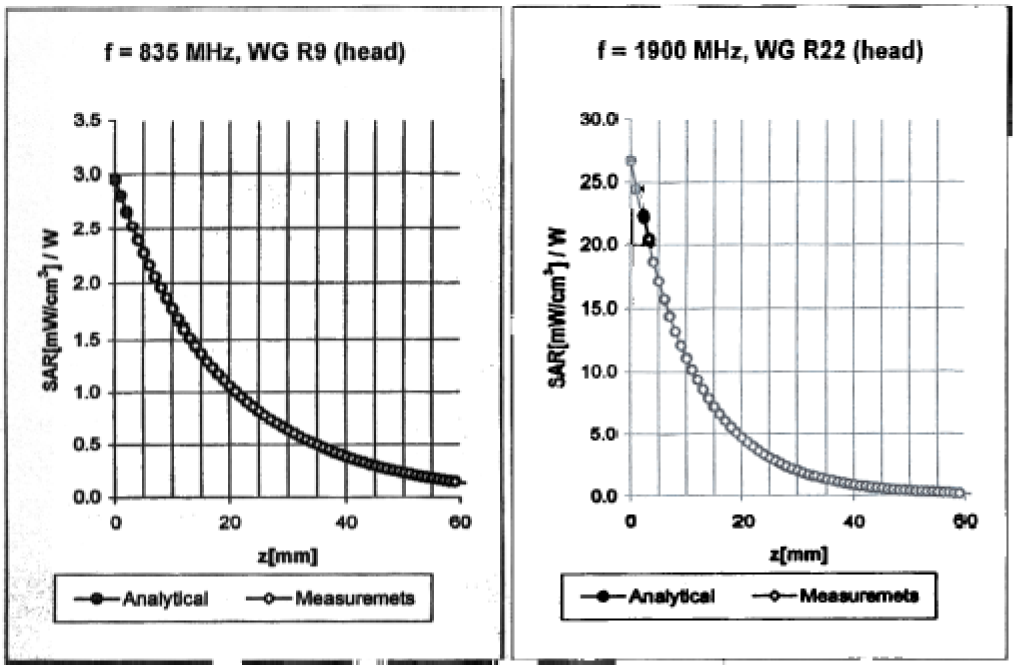
Conversion Factor Assessment



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**

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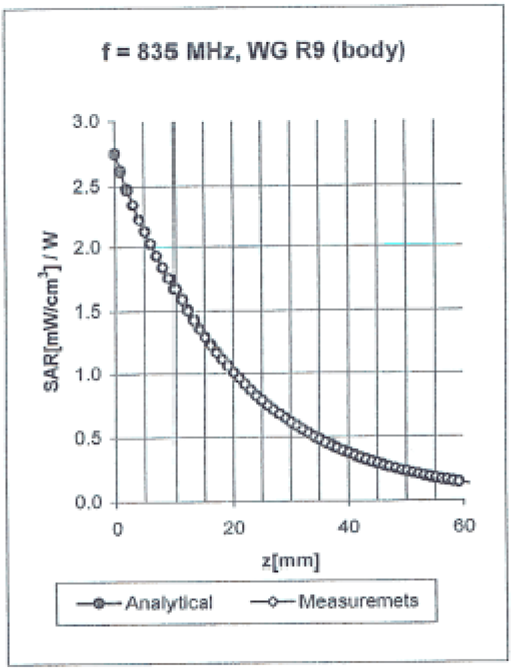
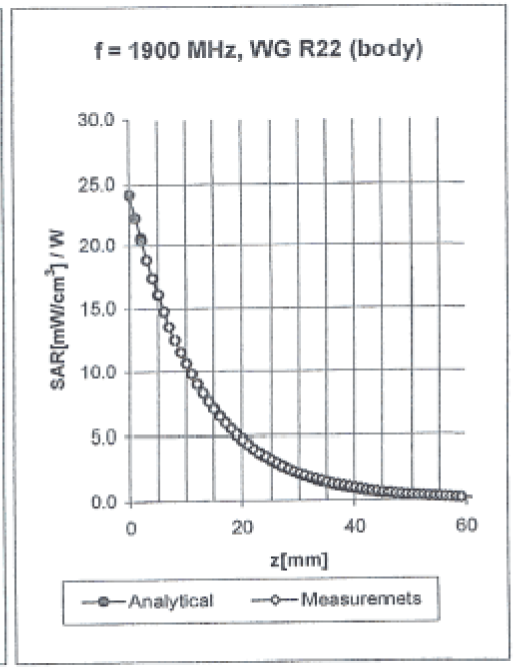
Convers ion Factor Assessment





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**

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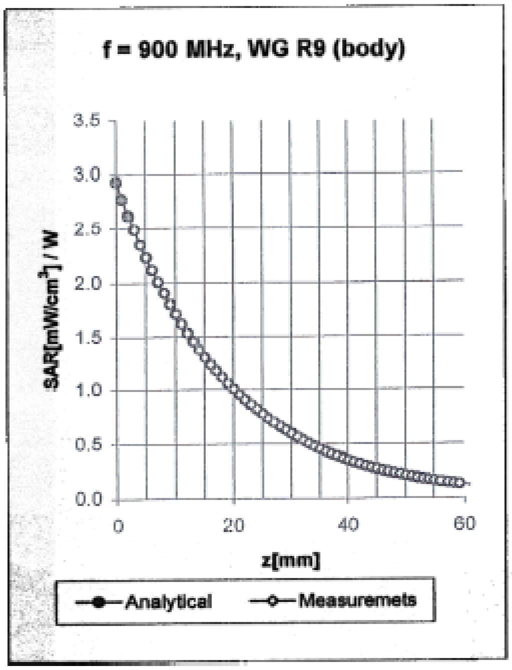
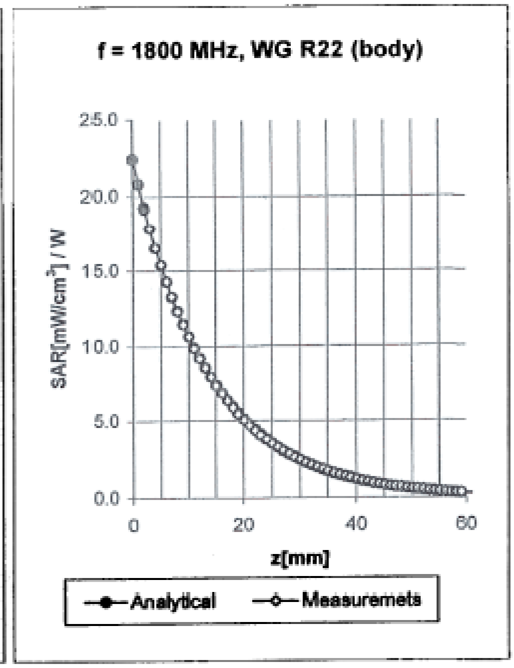
Conversion Factor Assessment





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

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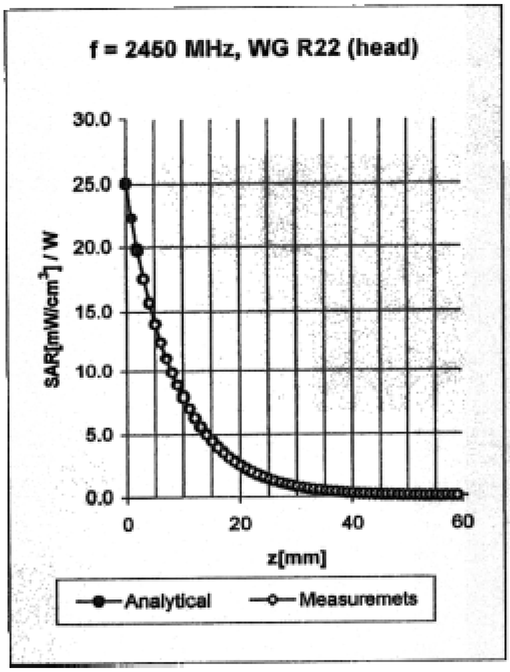
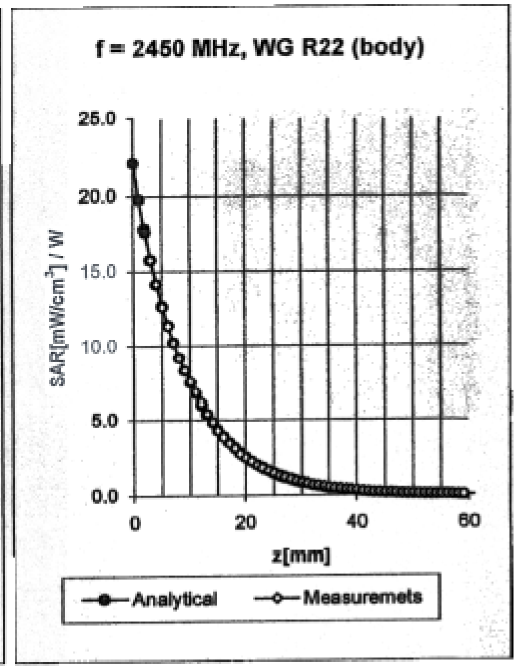
Conversion Factor Assessment





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**

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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

450MHz Body Liquid Validation

450 Body Liquid Validation

frequency	e'	e''
425000000.0000	56.1602	37.0912
426000000.0000	56.1417	37.1074
427000000.0000	56.0946	37.0921
428000000.0000	55.9576	37.0966
429000000.0000	55.9504	37.0824
430000000.0000	55.9302	37.0732
431000000.0000	55.9345	36.9871
432000000.0000	55.9457	37.0014
433000000.0000	55.9542	36.9254
434000000.0000	55.9438	37.0371
435000000.0000	55.9324	36.8517
436000000.0000	55.9391	36.9428
437000000.0000	55.9278	36.8085
438000000.0000	54.9215	36.7923
439000000.0000	54.8354	36.7485
440000000.0000	54.8437	36.7458
441000000.0000	54.7932	36.7127
442000000.0000	54.6467	36.6951
443000000.0000	54.5489	36.6845
444000000.0000	54.3479	36.6744
445000000.0000	54.3057	36.7087
446000000.0000	54.2903	36.6893
447000000.0000	54.2761	36.7548
448000000.0000	54.1560	36.6478
449000000.0000	54.0937	36.6519
450000000.0000	54.0918	36.7084
451000000.0000	54.0437	36.6891
452000000.0000	54.0123	36.7447
453000000.0000	53.8471	36.6237
454000000.0000	53.9538	36.6371
455000000.0000	53.9413	36.6175
456000000.0000	53.8493	36.6058
457000000.0000	53.8500	36.6833
458000000.0000	53.8578	36.6729
459000000.0000	53.8642	36.7032
460000000.0000	53.7915	36.5880
461000000.0000	53.8021	36.6124
462000000.0000	53.8193	36.6357
463000000.0000	53.7968	36.5187
464000000.0000	53.7885	36.6273
465000000.0000	53.7745	36.6178
466000000.0000	53.7906	36.5427
467000000.0000	53.8098	36.6819
468000000.0000	53.8087	36.6574
469000000.0000	54.8171	36.6319
470000000.0000	54.1127	36.6187
471000000.0000	54.0235	36.6068
472000000.0000	54.1832	36.5214
473000000.0000	54.2079	36.6857
474000000.0000	54.2107	36.6715
475000000.0000	54.3588	36.6114

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.9189$

where $f = 450x\ 10^6$

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

$\varepsilon'' = 36.7084$

450MHz Head Liquid Validation

450 Head Liquid Validation (New)

frequency	e'	e''
425000000.0000	43.2871	36.3653
426000000.0000	43.1512	36.2717
427000000.0000	43.1317	36.2971
428000000.0000	43.1221	36.2658
429000000.0000	43.2049	36.1973
430000000.0000	43.1587	36.2924
431000000.0000	43.1651	36.2517
432000000.0000	43.1871	36.3759
433000000.0000	43.2675	36.4634
434000000.0000	43.2098	36.4716
435000000.0000	43.2873	36.5679
436000000.0000	43.2769	36.5847
437000000.0000	43.2637	36.6037
438000000.0000	43.1643	36.6126
439000000.0000	43.0576	36.7463
440000000.0000	43.0541	36.7227
441000000.0000	43.1722	36.7874
442000000.0000	43.0776	36.7914
443000000.0000	43.0754	36.6936
444000000.0000	43.1237	36.5786
445000000.0000	43.0764	36.6077
446000000.0000	42.9126	35.5052
447000000.0000	43.0740	36.5319
448000000.0000	43.1019	36.5287
449000000.0000	43.0481	36.5812
450000000.0000	43.0314	36.5147
451000000.0000	42.9828	35.5194
452000000.0000	43.0213	36.4038
453000000.0000	43.0121	36.4317
454000000.0000	42.9808	35.5946
455000000.0000	42.9751	35.5966
456000000.0000	42.9613	35.4247
457000000.0000	42.9987	35.4790
458000000.0000	42.9435	35.3672
459000000.0000	42.9197	35.3856
460000000.0000	42.9618	35.3954
461000000.0000	42.8569	35.3212
462000000.0000	42.7154	35.3545
463000000.0000	42.8290	35.4574
464000000.0000	42.8617	35.3128
465000000.0000	42.8243	35.3217
466000000.0000	42.8745	35.3351
467000000.0000	42.7364	35.3147
468000000.0000	42.7258	35.2544
469000000.0000	42.7198	35.3124
470000000.0000	42.7365	35.3221
471000000.0000	42.6511	35.2965
472000000.0000	42.5578	35.2810
473000000.0000	42.6574	35.2744
474000000.0000	42.5978	35.1921
475000000.0000	42.5857	35.1859

0.9141

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.9141$

where $f = 450 \times 10^6$

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

$\varepsilon'' = 36.5147$

3 - EUT DESCRIPTION

Applicant:	Continental Conair Limited
Product Description:	GMRS Radio
FCC ID:	LBBHUM1200
Serial Number:	0003
Transmitter Frequency:	462.5625~467.725 MHz
Maximum Output Power:	1.8 W
Dimension:	7.9" L x 2.6"W x 17"H approximately
RF Exposure environment:	General Population/Uncontrolled
Power Supply:	Battery
Applicable Standard	FCC CFR 47, Part 95
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 gathered are from production sample, serial number: #0003, provided by the manufacturer.

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 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 modification(s) were made to the EUT.

5 – CONDUCTED OUTPUT POWER

5.1 Provision Applicable

Per FCC §2.1046 and FCC § 95.639 (d), no FRS unit, under any condition of modulation, shall exceed 0.500W effective radiated power (ERP).

Per FCC §2.1046 and FCC § 95.639 (a) (1), no GMRS unit, under any condition of modulation, shall exceed 50W Carrier Power (average TP during one unmodulated RF cycle) when transmission type A1D, F1D, .G1D, A3E, F3E or G3E.

5.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

5.3 Test equipment

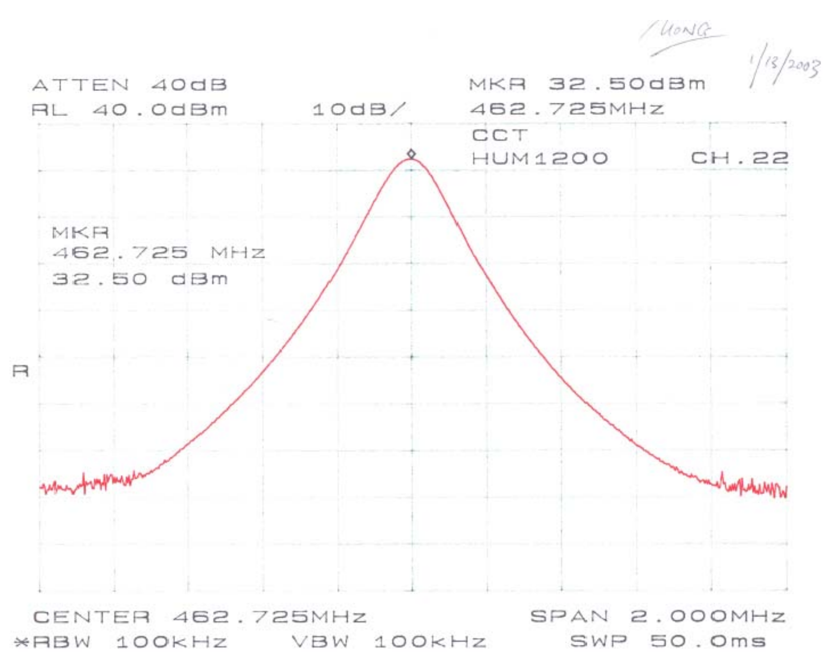
Hewlett Packard HP8564E Spectrum Analyzer, Calibration Date: 2003-08-01.
Hewlett Packard HP 7470A Plotter, Calibration not required.
A.H. Systems SAS200 Horn Antenna, Calibration Date: 2003-05-31
Com-Power AB-100 Dipole Antenna, Calibration Date: 2003-09-05

5.4 Test Results

Frequency (MHz)	Output Power in dBm	Output Power in W	Limit (W, ERP)
462.718	32.5	1.8	50

Note: The output power measured is conducted. During SAR, it is more convenient to measure conducted power rather than EIRP. EMC measurements only required EIRP and results are within 9% between EIRP and conducted.

Please refer to the following plots.



6 - DOSIMETRIC ASSESSMENT SETUP

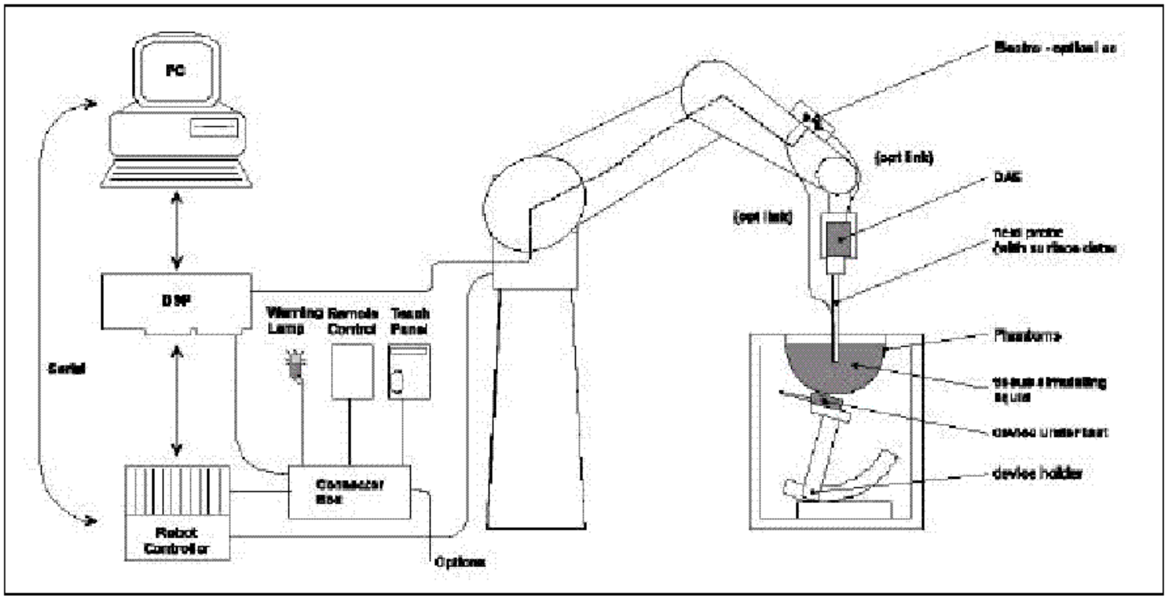
These measurements were performed with the automated near-field scanning system DASY3 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ±0.02mm. Special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

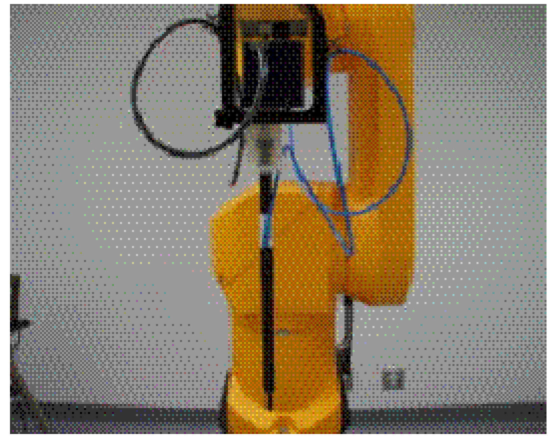


The DASY3 system for performing compliance tests consist of the following items:

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.

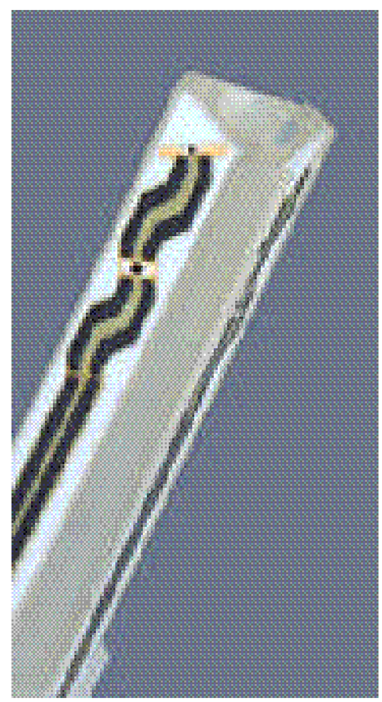
6.2 System Components

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



Inside view of ET3DV6 E-field Probe

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.

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.

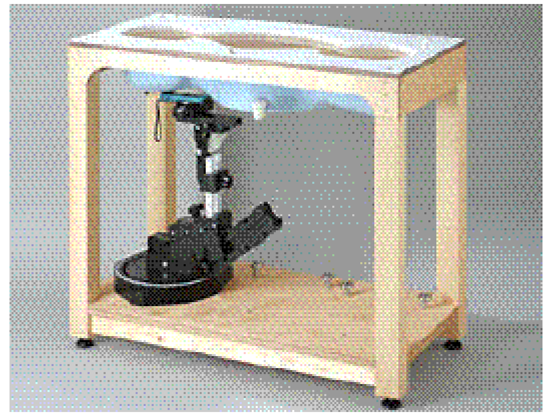
The power flow density is calculated assuming the excitation field as a free space field.

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

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

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)

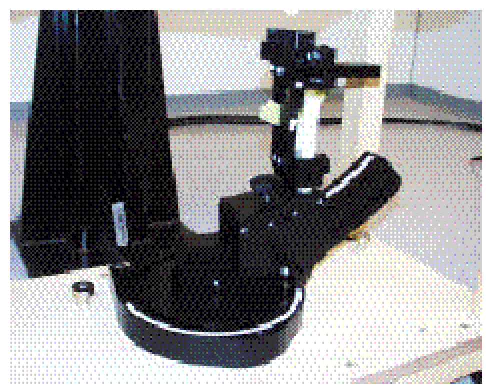


Generic Twin Phantom

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.

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 (450 MHz)

Validation Measurement	SAR @ 9.225mW Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 9.225mW Input averaged over 10g	SAR @ 1W Input averaged over 10g
Test 1	0.0451	4.89	0.0315	3.4
Test 2	0.0447	4.85	0.0312	3.38
Test 3	0.0448	4.86	0.0313	3.39
Test 4	0.0450	4.88	0.0313	3.39
Test 5	0.0451	4.89	0.0313	3.39
Test 6	0.0450	4.88	0.0315	3.4
Test 7	0.0451	4.89	0.0314	3.4
Test 8	0.0449	4.87	0.0312	3.38
Test 9	0.0449	4.87	0.0312	3.38
Test 10	0.0448	4.86	0.0311	3.37
Average	0.0449	4.874	0.0313	3.388

System validation result

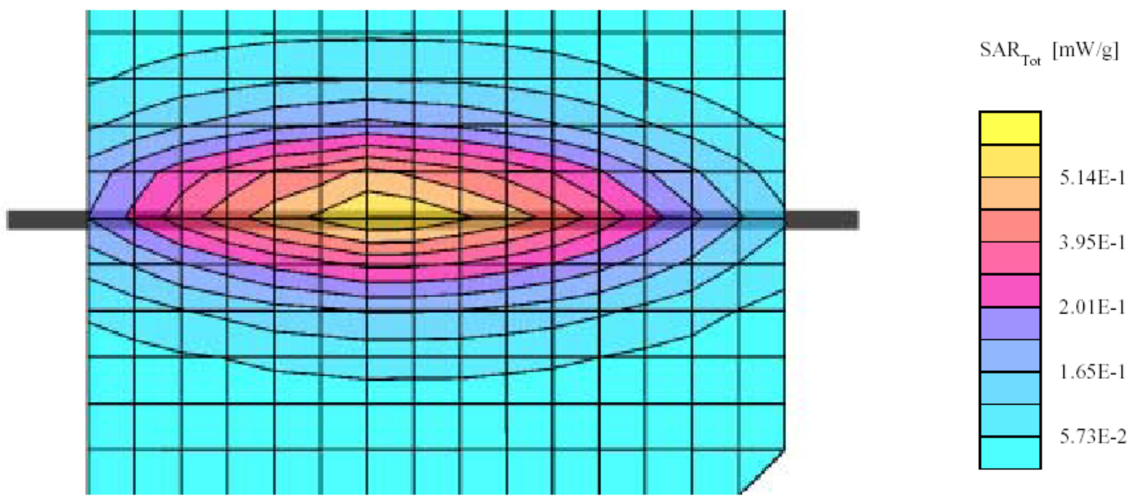
Ambient Temperature (ºC): 23.0
Relative Humidity (%): 49.3

Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
Body	450	ε	23	56.7	54.1	-4.58	±5
		σ	23	0.94	0.92	-2.13	±5
		1g SAR	23	4.874	4.879	0.103	±10
Head	450	ε	23	43.5	43.0	-1.15	±5
		σ	23	0.87	0.91	4.60	±5
		1g SAR	23	4.9	4.899	-0.02	±10

ε = relative permittivity, σ = conductivity and ρ=1000kg/m^3
Note: Body Forward power = 20.26 dBm = 106.17 mW
Head Forward power = 20.25 dBm = 105.93 mW

450 MHz Body Liquid System Validation (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.26 dBm, 1/13/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 450 MHz
Probe: ES3DV2 - SN3019; ConvF(7.30,7.30,7.30); Crest factor: 1.0; (Body liquid) 450 MHz: σ = 0.92 mho/m ε_r = 54.1 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.518 mW/g, SAR (10g): 0.334 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.01 dB



450 MHz Head Liquid System Validation (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.25 dBm, 1/13/2004)

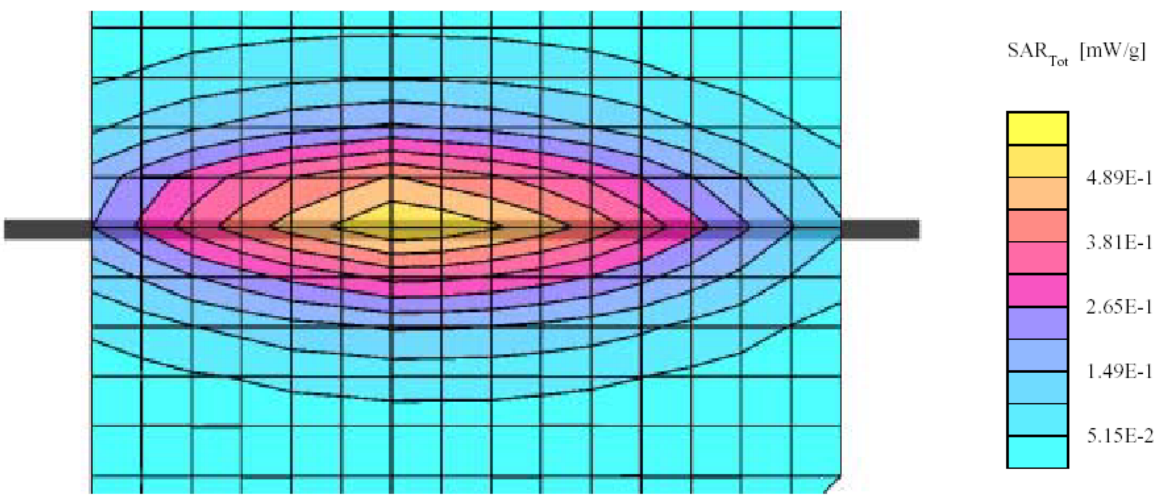
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 450 MHz

Probe: ES3DV2 - SN3019; ConvF(7.40,7.40,7.40); Crest factor: 1.0; (Head liquid) 450 MHz: σ = 0.91 mho/m ε_r = 43.0 ρ = 1.00 g/cm³

Cube 5x5x7: SAR (1g): 0.519 mW/g, SAR (10g): 0.334 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): 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).

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 8.1, the EUT complied with the FCC 2.1093 RF Exposure standards, with worst case of 1.37W.

8.1 SAR Test Data

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

Worst case SAR reading

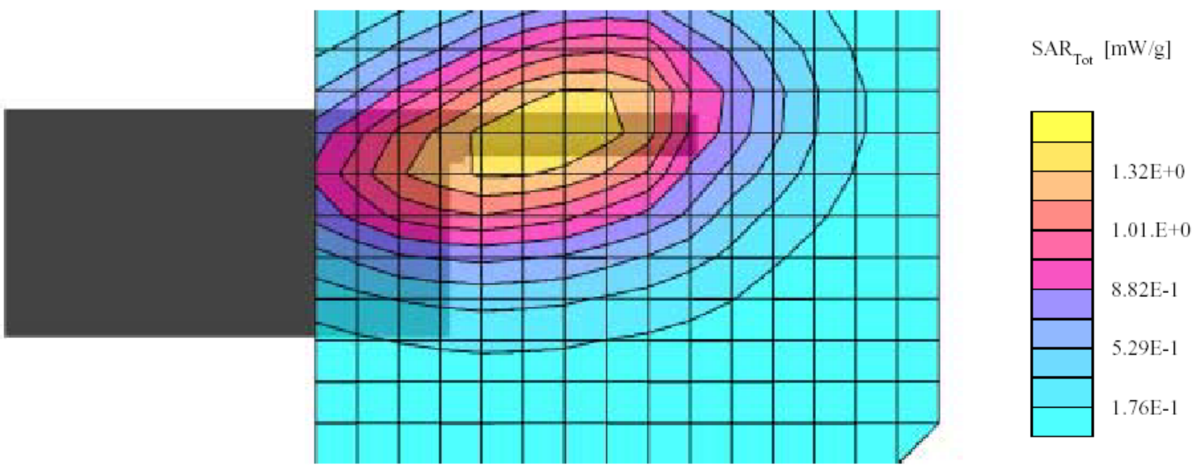
EUT position	Frequency (MHz)	Output Power (W)	Test Type	Antenna Type	Liquid	Phantom	Notes / Accessories	Measured (mW/g)		Limit (mW/g)	Plot #
								50% duty cycle	100% duty cycle		
Back touching phantom	462.7250	1.8	Body worn	Built-in	body	flat	With belt clip & headset	0.685	1.37	1.6	1
Face 2.5 cm separation from phantom	462.7250	1.8	Face-held	Built-in	head	flat	None	0.555	1.11	1.6	2

8.2 Plots of Test Result

The plots of test result were attached as reference.

CCT Telecom, Model: HUM1200 / HUM 1200Y / HUM 1250 / HUM 1250 PCS (Back side in touch with flat phantom with belt clip and headset, Mid channel, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 1/13/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 463 MHz
Probe: ES3DV2 - SN3019; ConvF(7.30,7.30,7.30); Crest factor: 1.0; 450 MHz body liquid: σ = 0.92 mho/m ε_r = 54.1 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.37 mW/g, SAR (10g): 0.975 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



CCT Telecom, Model: HUM1200 / HUM 1200Y / HUM 1250 / HUM 1250 PCS (Face 2.5 cm separation to flat phantom, Mid channel, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 1/13/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 463 MHz
Probe: ES3DV2 - SN3019; ConvF(7.40,7.40,7.40); Crest factor: 1.0; 450 MHz Head liquid: σ = 0.91 mho/m ε_r = 43.0 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 1.11 mW/g, SAR (10g): 0.841 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB

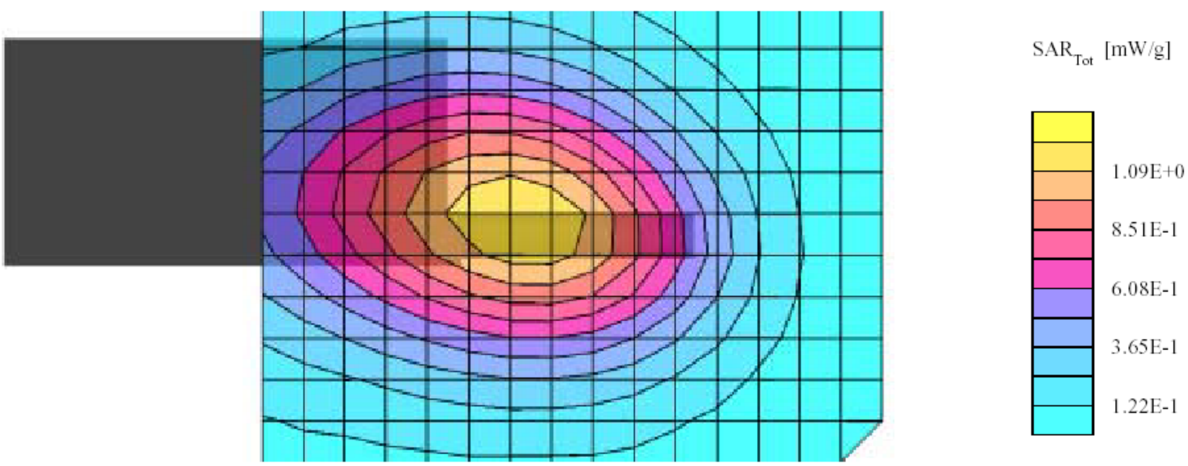
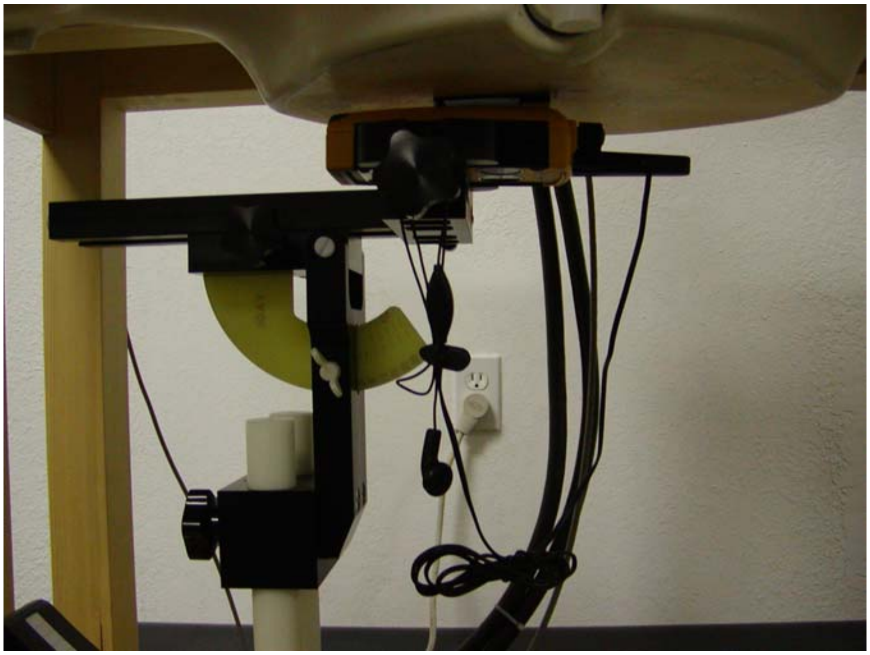


EXHIBIT A - SAR SETUP PHOTOGRAPHS

Body-Worn with Belt Clip & Headset in Touching with Phantom



2.5cm Separation to Flat Phantom

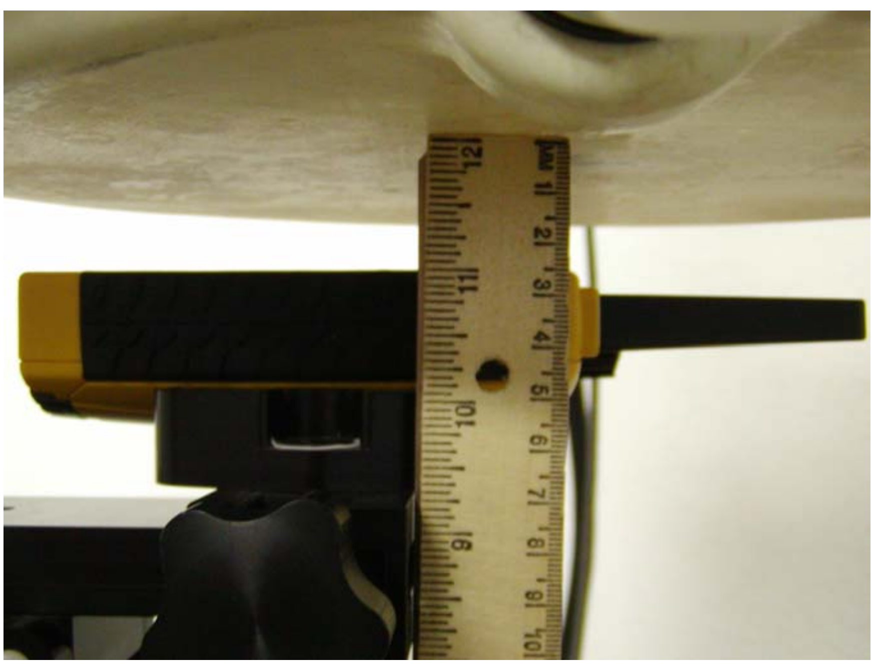


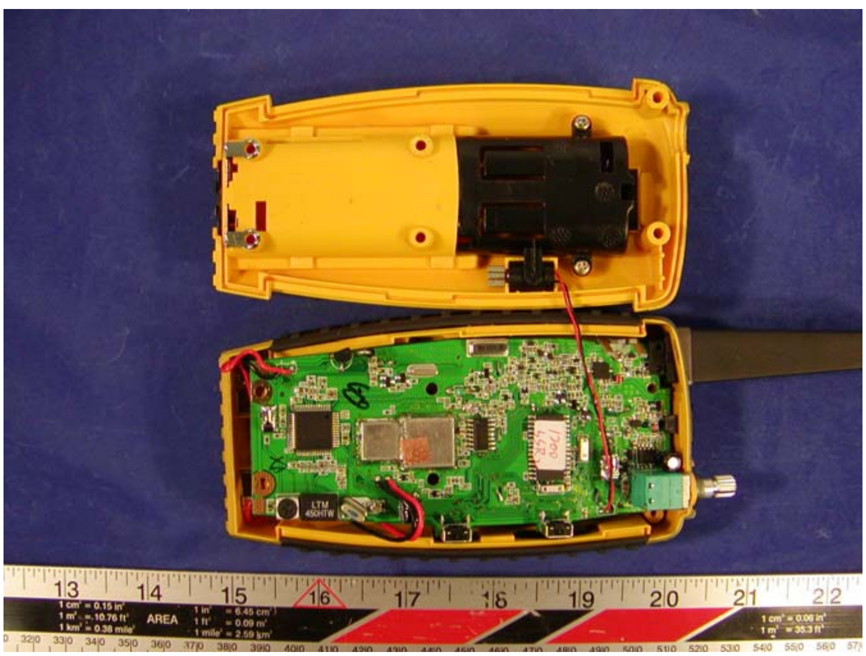
EXHIBIT B - EUT PHOTOGRAPHS

Chassis - Front View

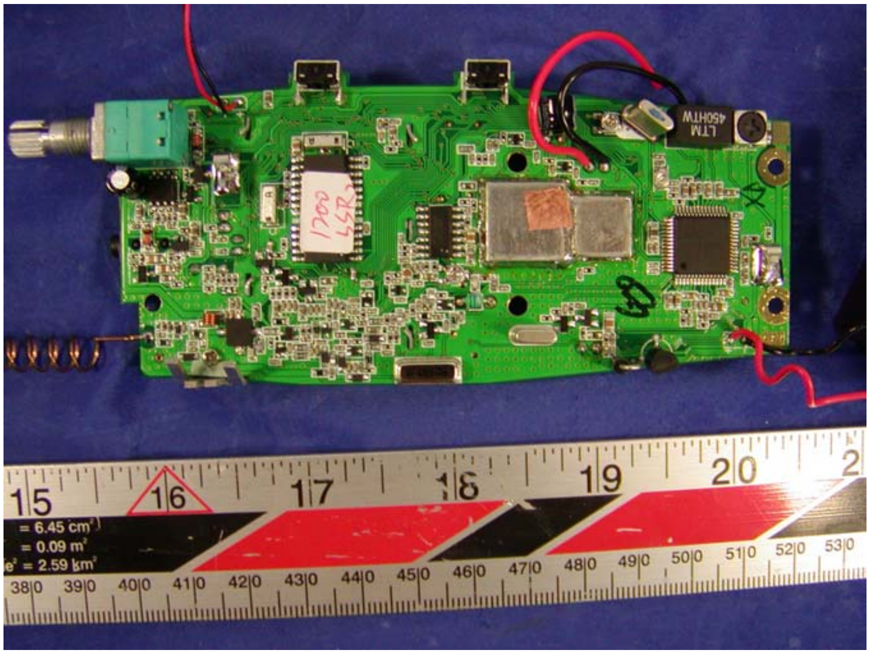
Chassis – Rear View

EUT – Top View

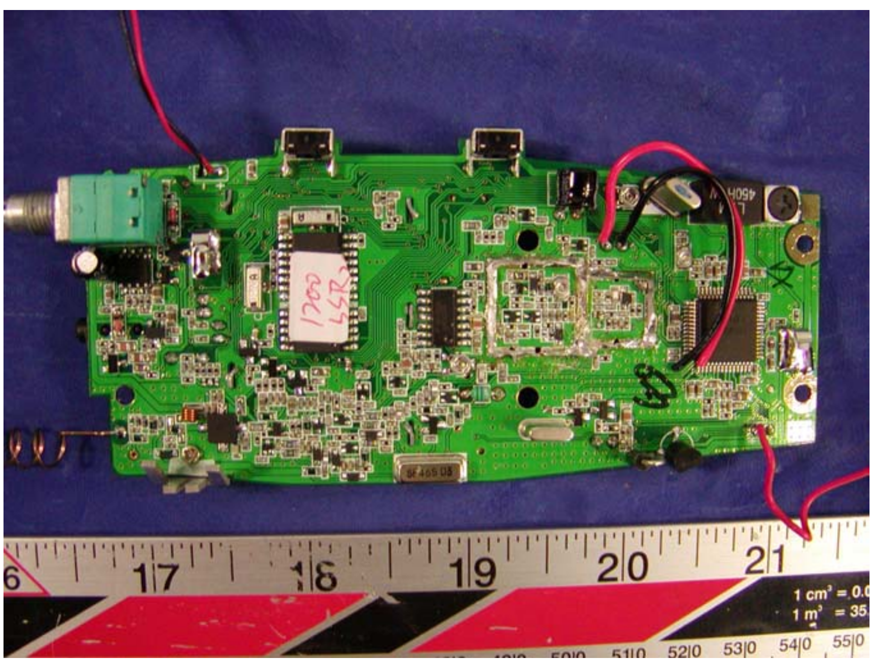
EUT – Housing and Board View



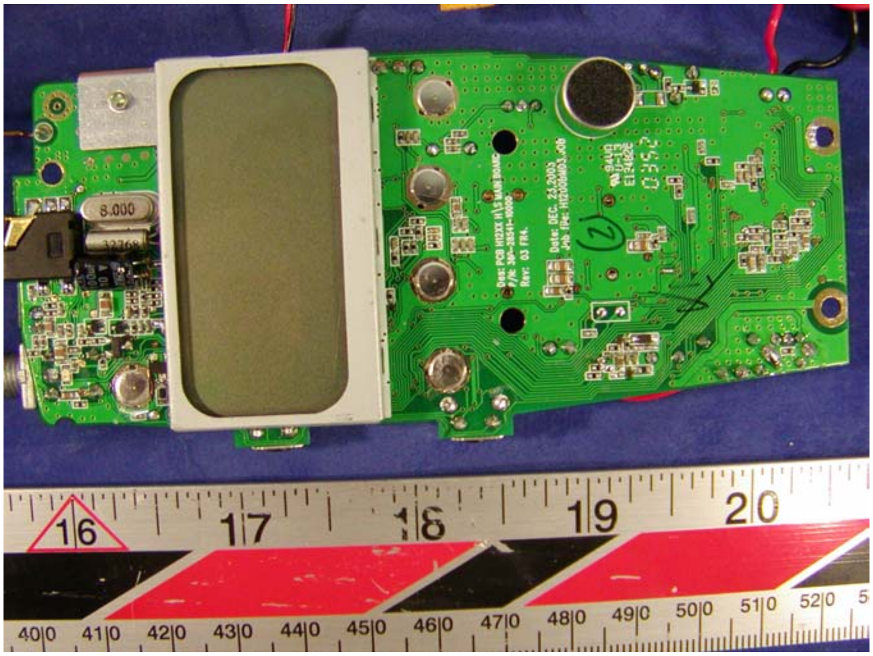
EUT - Component View



EUT – Component View with Shielding Removed



EUT – Solder View



EUT – Antenna Connection View

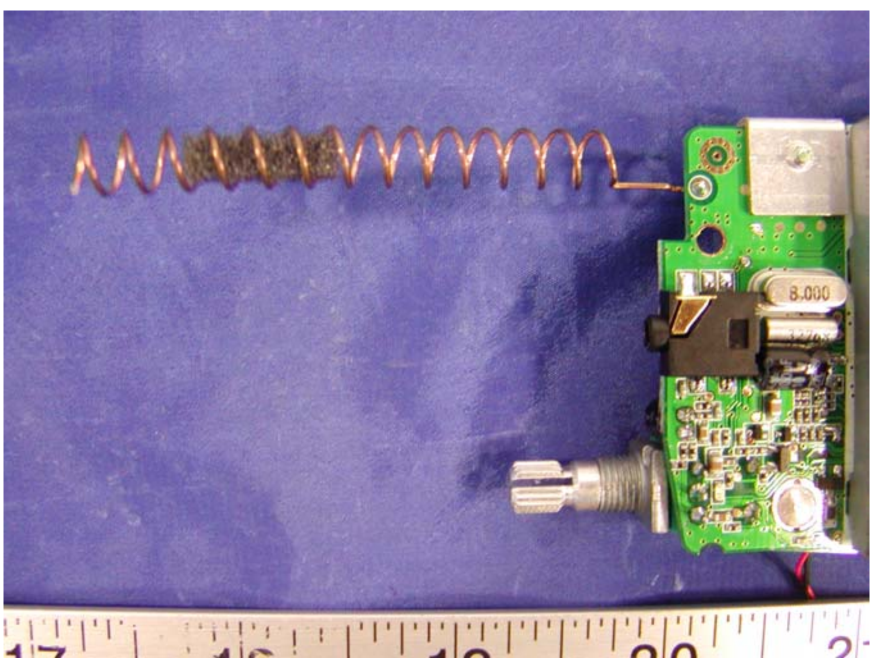


EXHIBIT C – Z-Axis

CCT Telecom, Model: HUM1200 / HUM 1200Y / HUM 1250 / HUM 1250 PCS (Back side in touch with flat phantom with belt clip and headset, Mid channel, Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 1/13/2003)

SAM Phantom; Section; Position: ; Frequency: 463 MHz

Probe: ES3DV2 - SN3019; ConvF(7.30,7.30,7.30); Crest factor: 1.0; 450 MHz body liquid: σ = 0.92 mho/m ε_r = 54.1 ρ = 1.00 g/cm³

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