SAR EVALUATION REPORT

For

MAXON ELECTRONICS AUSTRALIA PTY. LTD.

36A Gibson Ave, Padstow
New South Wales 2212, Australia

FCC ID: Q2FMM-5500U

This Report Concerns: ☒ Original Report	**Equipment Type:** CDMA 1xRTT USB Voice/Data Modem

Test Engineer:	Eric Hong /
Report No.:	R0406251S
Report Date:	2004-07-14
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

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 C95.1-1992 [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:

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.

880-KP0301061-A Page 1 (1)

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!)

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** $\mu V/(V/m)^2$

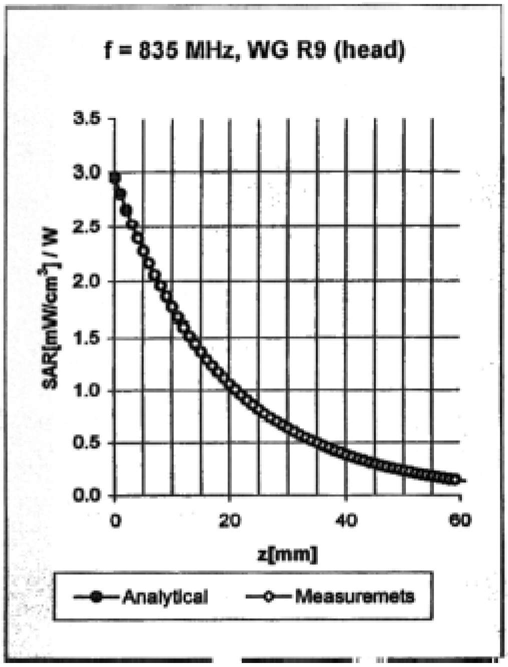
Diode Compression

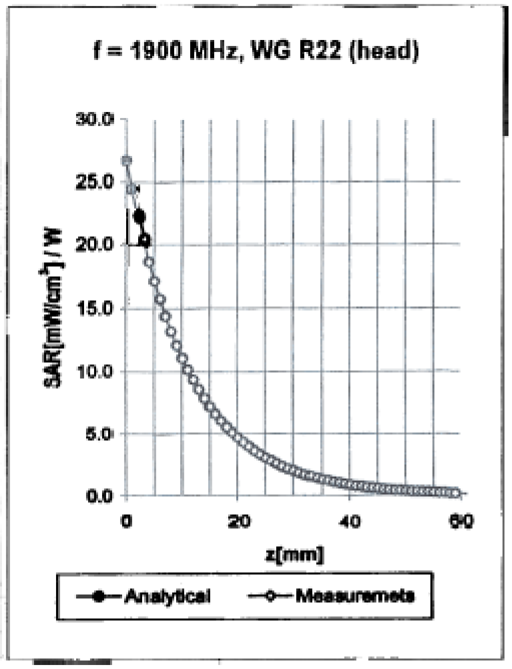
DCP X	**99**
DCP Y	**99**
DCP Z	**99**

Sensor Offset

Probe Tip to Sensor Center	**2.1**	mm

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**

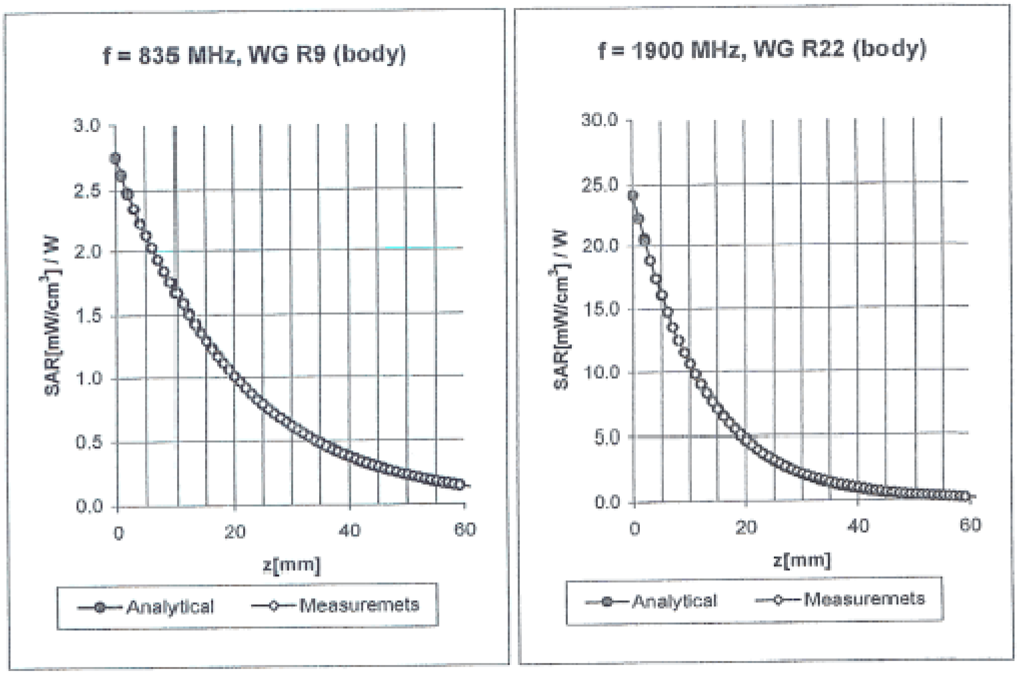
Head **1900 MHz** **ε_r = 40.0 ± 5%** **σ = 1.40 ± 5% mho/m**

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**

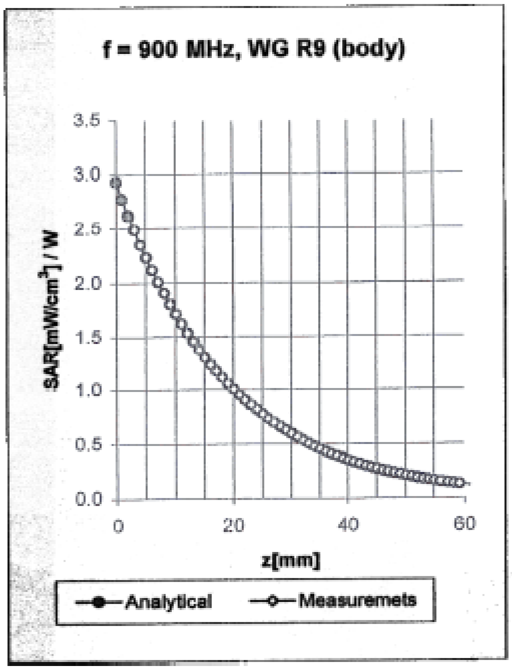
Body **1900 MHz** ε_r **= 53.3 ± 5%** **σ = 1.52 ± 5% mho/m**

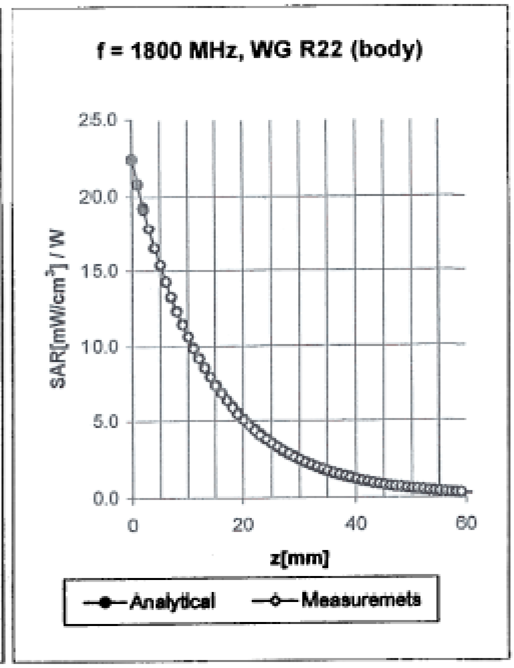
Valid for f=1805-1995 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

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**

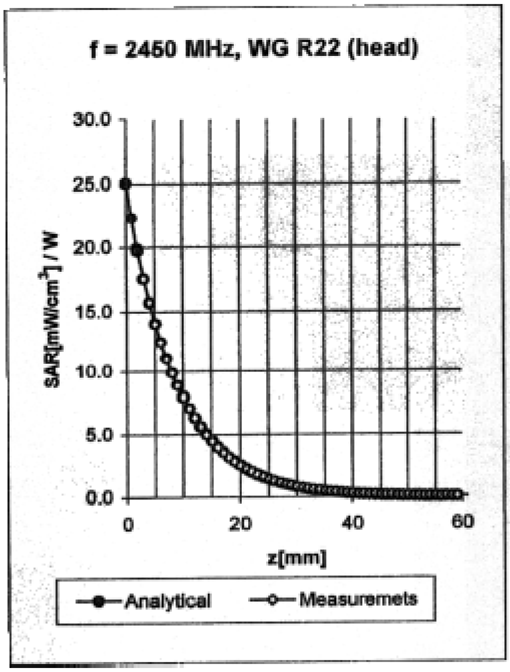
Body **1800 MHz** ε_r **= 53.3 ± 5%** **σ = 1.52 ± 5% mho/m**

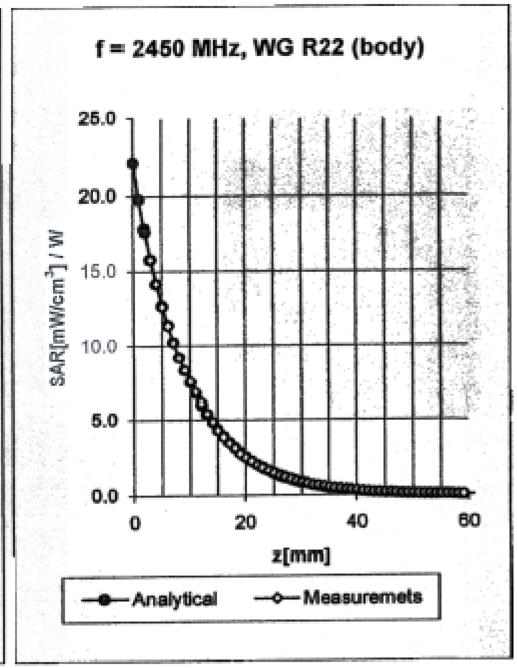
Valid for f=1710-1890 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

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**

Page 5 of 6

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**

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

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

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

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**

835 MHz Body Liquid Validation

frequency	e'	e''
815000000.0000	54.9324	20.9526
815800000.0000	54.9887	20.9353
816600000.0000	54.9342	20.9315
817400000.0000	54.9658	20.8917
818200000.0000	54.9177	20.8756
819000000.0000	54.9353	20.8634
819800000.0000	54.9112	20.8562
820600000.0000	54.9232	20.9061
821400000.0000	54.9165	20.8992
822200000.0000	54.9406	20.8653
823000000.0000	54.8658	20.8285
823800000.0000	54.8671	20.8654
824600000.0000	54.9141	20.8476
825400000.0000	54.8630	20.8062
826200000.0000	54.8502	20.7231
827000000.0000	54.8680	20.7217
827800000.0000	54.8297	20.7038
828600000.0000	54.8584	20.7313
829400000.0000	54.7893	20.7536
830200000.0000	54.7983	20.6981
831000000.0000	54.8342	20.6947
831800000.0000	54.7799	20.7165
832600000.0000	54.8231	20.7186
833400000.0000	54.7761	20.6848
834200000.0000	54.8049	20.7481
835000000.0000	54.8084	20.6910
835800000.0000	54.7976	20.6931
836600000.0000	54.7723	20.6645
837400000.0000	54.8406	20.6828
838200000.0000	54.8011	20.6814
839000000.0000	54.7294	20.6673
839800000.0000	54.7798	20.6835
840600000.0000	54.7367	20.6414
841400000.0000	54.7796	20.5873
842200000.0000	54.7301	20.6741
843000000.0000	54.7228	20.6117
843800000.0000	54.7196	20.6282
844600000.0000	54.7052	20.5794
845400000.0000	54.7896	20.6242
846200000.0000	54.7255	20.6021
847000000.0000	54.7152	20.6042
847800000.0000	54.6517	20.6334
848600000.0000	54.7064	20.5448
849400000.0000	54.7071	20.5761
850200000.0000	54.6723	20.6152
851000000.0000	54.6798	20.6083
851800000.0000	54.6833	20.5525
852600000.0000	54.6464	20.5348
853400000.0000	54.6020	20.3535
854200000.0000	54.6201	20.4412
855000000.0000	54.6397	20.4139

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.9611$

where $f = 835 \times 10^6$

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

$\varepsilon'' = 20.6910$

835 MHz Head Liquid Validation

frequency	e'	e''
815000000.0000	41.8235	19.7432
815800000.0000	41.8776	19.7224
816600000.0000	41.8233	19.7377
817400000.0000	41.8547	19.6982
818190000.0000	41.8165	19.6996
819000000.0000	41.8241	19.6923
819800000.0000	41.8005	19.6857
819600000.0000	41.8124	19.6981
821400000.0000	41.8057	19.6979
822190000.0000	41.8314	19.6978
823000000.0000	41.7546	19.6977
823800000.0000	41.7565	19.6876
824600000.0000	41.8034	19.6775
824100000.0000	41.7521	19.6574
826190000.0000	41.7410	19.6473
827000000.0000	41.7573	19.6372
827800000.0000	41.7185	19.6271
828600000.0000	41.7472	19.6373
829400000.0000	41.6781	19.6474
830190000.0000	41.6869	19.6475
831000000.0000	41.7230	19.6362
831800000.0000	41.6687	19.5984
832600000.0000	41.7119	19.5832
833400000.0000	41.6648	19.5743
834190000.0000	41.6937	19.5483
835000000.0000	41.6972	19.5324
835800000.0000	41.6864	19.5297
836600000.0000	41.6632	19.5456
837400000.0000	41.7315	19.5537
838190000.0000	41.6902	19.5624
839000000.0000	41.6182	19.5765
839800000.0000	41.6681	19.5831
840600000.0000	41.6275	19.5626
841400000.0000	41.6682	19.5585
842190000.0000	41.6216	19.5568
843000000.0000	41.6135	19.5441
843800000.0000	41.6084	19.5352
844600000.0000	41.5940	19.5423
844100000.0000	41.6774	19.5537
846190000.0000	41.6143	19.5635
847000000.0000	41.6047	19.5726
847800000.0000	41.5625	19.5847
848600000.0000	41.5932	19.5939
849400000.0000	41.5963	19.5871
850190000.0000	41.5632	19.5847
851000000.0000	41.5686	19.5959
851800000.0000	41.5725	19.6047
852600000.0000	41.5652	19.6135
853400000.0000	41.4927	19.6217
841190000.0000	41.5079	19.6326
855000000.0000	41.5285	19.6248

$\sigma = \omega \varepsilon_o \varepsilon'' = 2 \pi f \varepsilon_o \varepsilon''=0.9073$

where $f = 835 \times 10^6$

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

$\varepsilon'' =19.5324$

3 - EUT DESCRIPTION

Applicant:	Maxon Electronics Australia Pty. Ltd
Product Description:	CDMA 1xRTT USB Voice/Data Modem
FCC ID:	Q2FMM-5500U
Serial Number:	3B000900,1
Transmitter Frequency:	824.64~848.37MHz
Maximum Output Power:	0.281
Dimension:	58mm L x 38mm W x 12mm H approximately
RF Exposure environment:	General Population/Uncontrolled
Applicable Standard	FCC CFR 47, Part 22
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: 3B000900,1 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

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

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

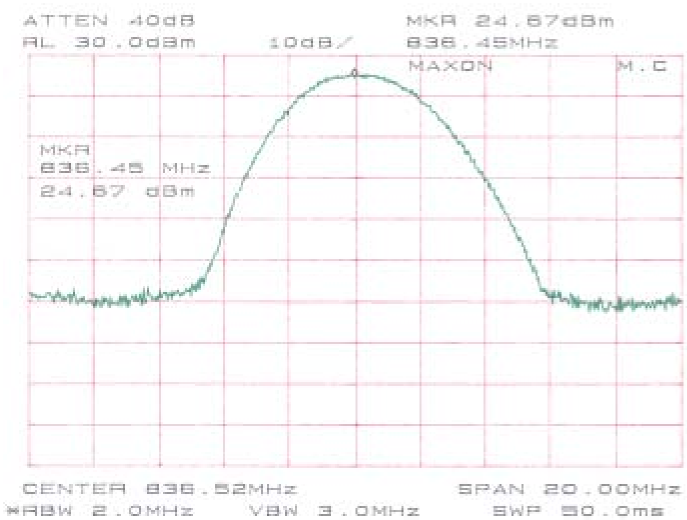
Hewlett Packard HP8564E Spectrum Analyzer, Calibration Date: 2003-08-01.
Hewlett Packard HP 7470A Plotter, Calibration not required.
A.H. Systems SAS200 Horn Antenna, Calibration Date: 2004-05-31
Com-Power AB-100 Dipole Antenna, Calibration Date: 2003-09-05

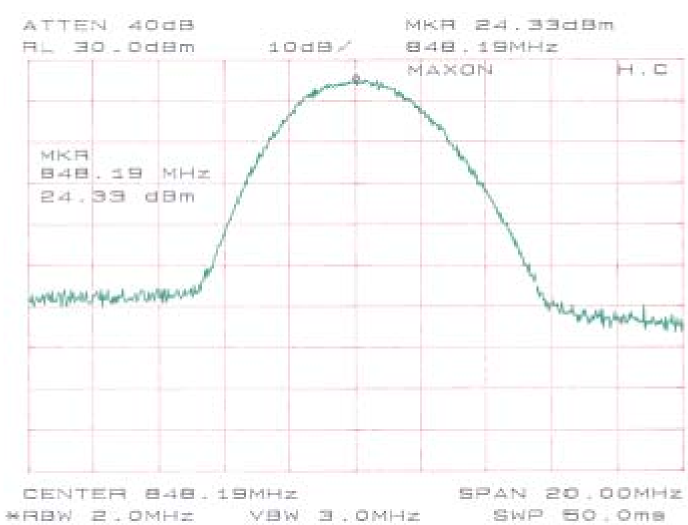
5.4 Test Results

Frequency (MHz)	Output Power in dBm	Output Power in W	Limit (W, ERP)
824.83	24.33	0.271	7
836.32	24.67	0.293	7
848.29	24.33	0.271	7

Please refer to the following plots.


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 24.33dBm
824.73MHz
MAXON
L.C
MKR
824.73 MHz
24.33 dBm
CENTER 824.73MHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 24.67dBm
836.45MHz
MAXON
M.C
MKR
836.45 MHz
24.67 dBm
CENTER 836.52MHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 24.33dBm
848.19MHz
MAXON
H.C
MKR
848.19 MHz
24.33 dBm
CENTER 848.19MHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms

6 - DOSIMETRIC ASSESSMENT SETUP

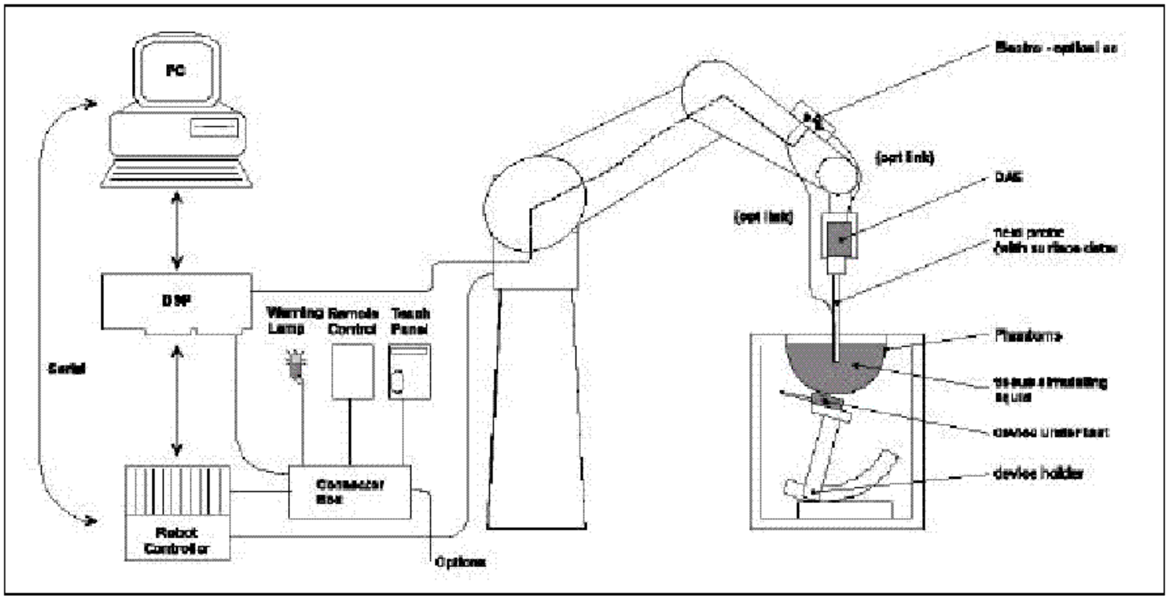
These measurements were performed with the automated near-field scanning system DASY3 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ±0.02mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The system is described in detail in [3].

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

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

Ingredients (% 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	41.5	55.2	42.0	55.9	39.9	53.3	39.8	53.6
Conductivity (s/m)	0.85	0.83	0.9	0.97	1.0	0.98	1.42	1.52	1.88	1.81

6.1 Measurement System Diagram

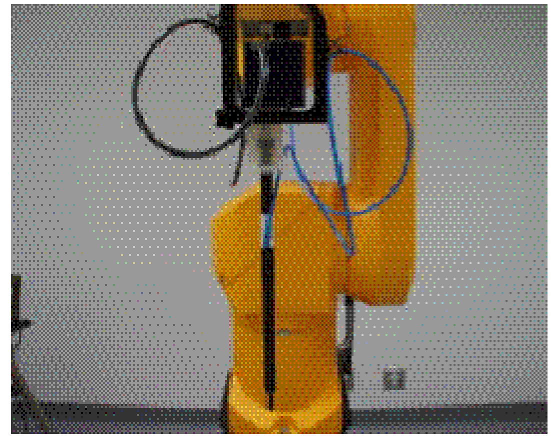


The DASY3 system for performing compliance tests consist of the following items:

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.

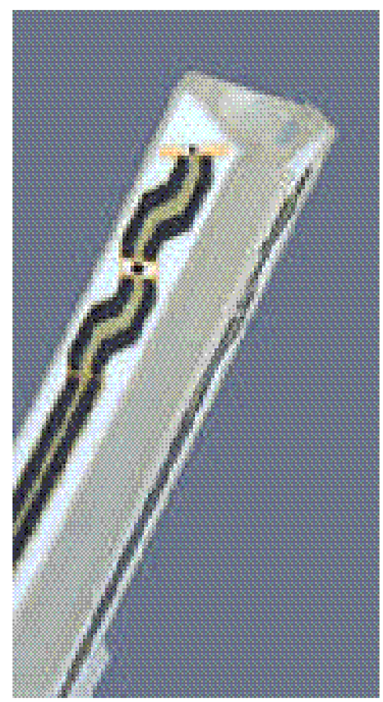
6.2 System Components

ET3DV6 Probe Specification
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



Photograph of the 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.



Inside view of ET3DV6 E-field Probe

E-Field Probe Calibration Process

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Data Evaluation

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

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

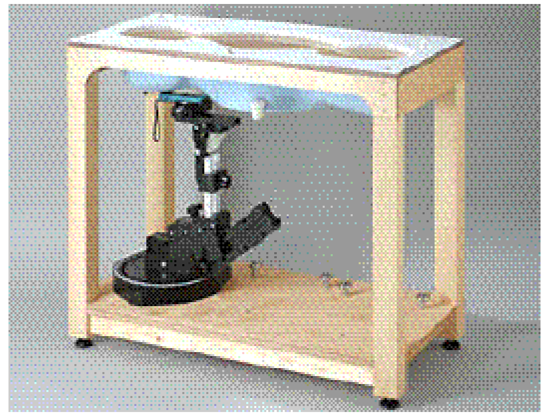
The power flow density is calculated assuming the excitation field as a free space field.

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

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)

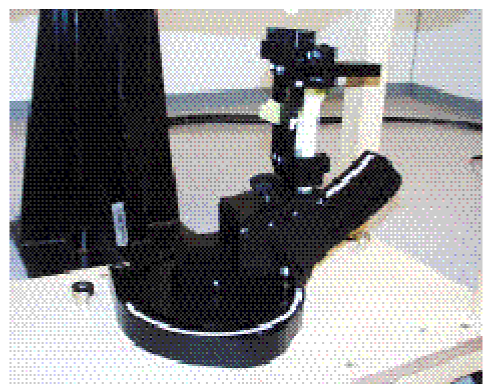


Generic Twin Phantom

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

Validation Measurement	SAR @ 0.025W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.025W Input averaged over 10g	SAR @ 1W Input averaged over 10g
Test 1	0.222	8.88	0.112	4.48
Test 2	0.221	8.84	0.111	4.44
Test 3	0.222	8.88	0.112	4.48
Test 4	0.220	8.80	0.111	4.44
Test 5	0.223	8.92	0.113	4.52
Test 6	0.222	8.88	0.115	4.60
Test 7	0.221	8.84	0.114	4.56
Test 8	0.222	8.88	0.114	4.56
Test 9	0.223	8.92	0.113	4.52
Test 10	0.222	8.88	0.112	4.48
Average	0.2218	8.872	0.1127	4.51

System Validation Result

Ambient Temperature (ºC): 23

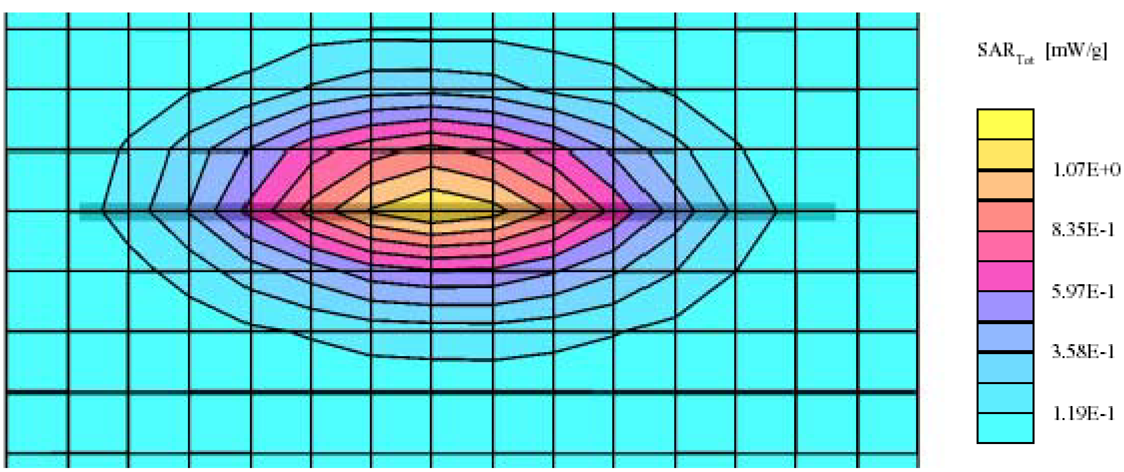
Date	Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation	Limits [%]
2004-07-07	Body	835	ε_r	22	55.2	54.8	-0.72	±5
			σ	22	0.97	0.96	-1.03	±5
			1g SAR	22	8.872	8.880	0.09	±10
2004-07-07	Head	835	ε_r	22	41.5	41.7	0.48	±5
			σ	22	0.90	0.91	1.11	±5
			1g SAR	22	9.5	9.51	0.105	±10

ε_r = relative permittivity, σ = conductivity and ρ=1000kg/m^3

Body Forward Power = 20.93 dBm =123.88 mW
Head Forward Power = 20.71 dBm =117.76 mW

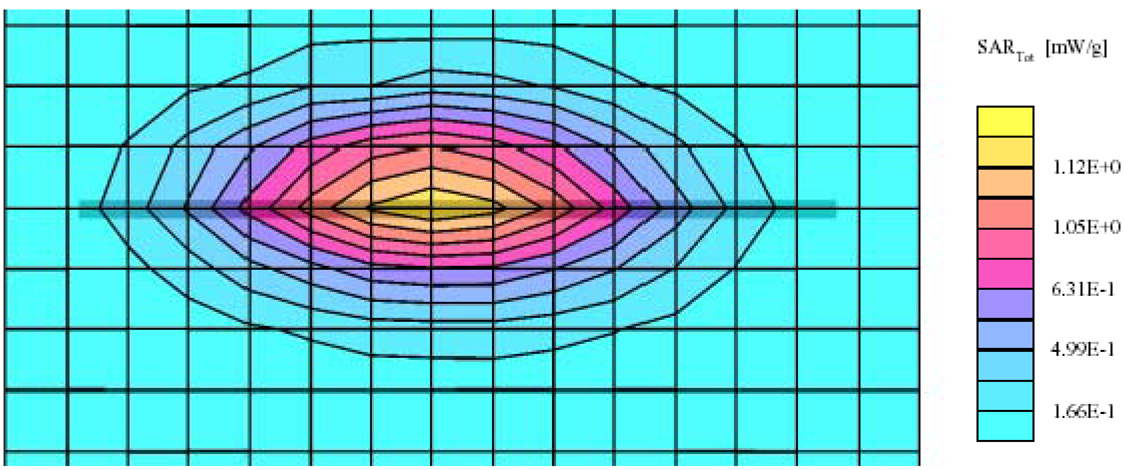
System Validation 835 MHz Body liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 20.93 dBm, 07/7/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; 835 (Body) MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.10 mW/g, SAR (10g): 0.652 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 20.71 07/7/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ES3DV2 - SN3019; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 (Head) MHz: σ = 0.91 mho/m ε_r = 41.7 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.12 mW/g, SAR (10g): 0.692 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 dosimeter 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 0.242 mW/g.

8.1 SAR Test Data

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

Host Laptop	Position	Frequency (MHz)	Output Power (dBm)	Test Type	Antenna position	Liquid	Phantom	Measured (mW/g)	Limit (mW/g)	Plot #
Compacl	Bottom side touching phantom	835	24.67	Body Worn	Antenna pointing down and perpendicular with phantom	Body	Body	0.167	1.6	1
Compacl	Bottom side touching phantom	835	24.67	Body Worn	Antenna parallel with phantom	Body	Body	0.220	1.6	2
Compacl	Side Bystander 1.5cm Separation	835	24.67	Body Worn	Antenna parallel with phantom	Body	Body	0.0428	1.6	3
Compacl	Side Bystander 1.5cm Separation	835	24.67	Body Worn	Antenna parallel with phantom with headset	Body	Body	0.0381	1.6	4
Dell	Bottom side touching phantom	835	24.67	Body Worn	Antenna pointing down and perpendicular with phantom	Body	Body	0.129	1.6	5
Dell	Bottom side touching phantom	835	24.67	Body Worn	Antenna pointing down and perpendicular with phantom with Headset	Body	Body	0.101	1.6	6
Dell	Bottom side touching phantom	835	24.67	Body Worn	Antenna parallel with phantom	Body	Body	0.137	1.6	7
Dell	Side Bystander 1.5cm Separation	835	24.67	Body Worn	Antenna parallel with phantom	Body	Body	0.162	1.6	8
Sony	Bottom side touching phantom	835	24.67	Body Worn	Antenna pointing down and perpendicular with phantom	Body	Body	0.179	1.6	9
Sony	Bottom side touching phantom	835	24.67	Body Worn	Antenna parallel with phantom	Body	Body	0.242	1.6	10
Sony	Side Bystander 1.5cm Separation	835	24.67	Body Worn	Antenna parallel with phantom	Body	Body	0.0774	1.6	11
Sony	Side Bystander 1.5cm Separation	835	24.67	Body Worn	Antenna parallel with phantom with headset	Body	Body	0.0966	1.6	12

8.2 Plots of Test Result

The plots of test result were attached as reference.

Mason Electronics, Model: MM-5500U (Notebook Model: Compacl, bottom side touch phantom, antenna pointing down and perpendicular to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

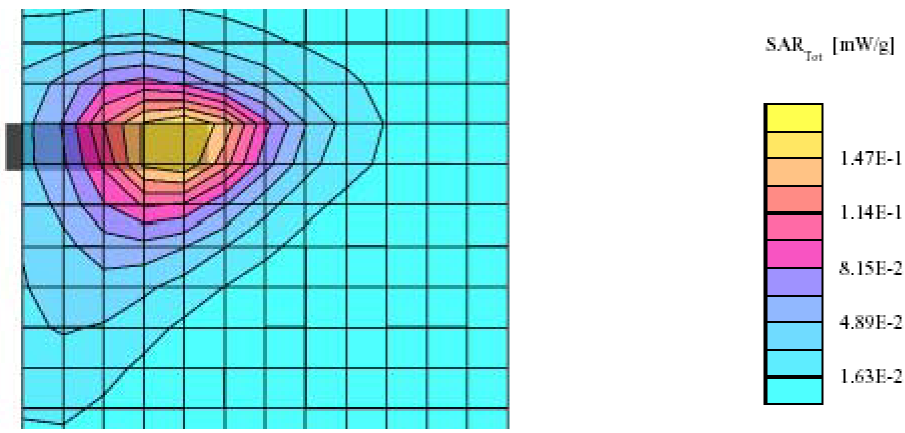
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 837 MHz

Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³

Cube 5x5x7: SAR (1g): 0.167 mW/g, SAR (10g): 0.103 mW/g, (Worst-case extrapolation)

Coarse: Dx = 12.0, Dy = 12.0, Dz = 1.0

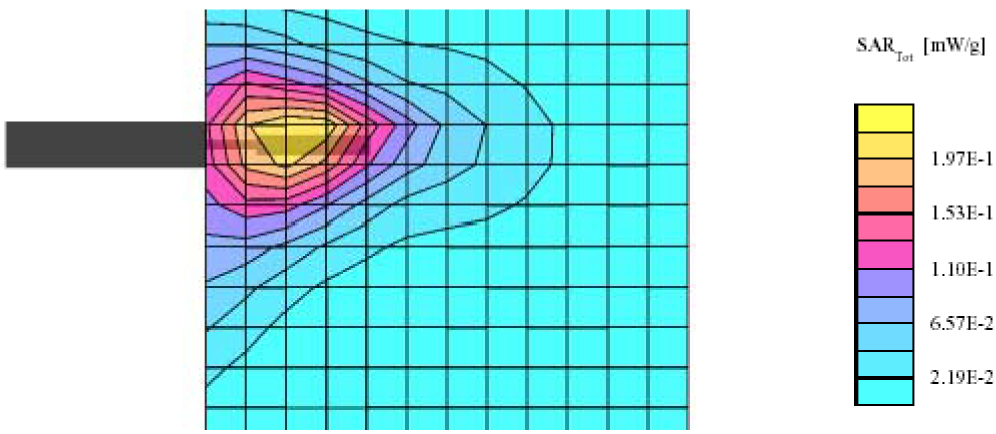
Powerdrift: 0.02 dB



Plot #1

Mason Electronics, Model: MM-5500U (Notebook Model: Compacl, bottom side touch phantom, antenna paraller to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

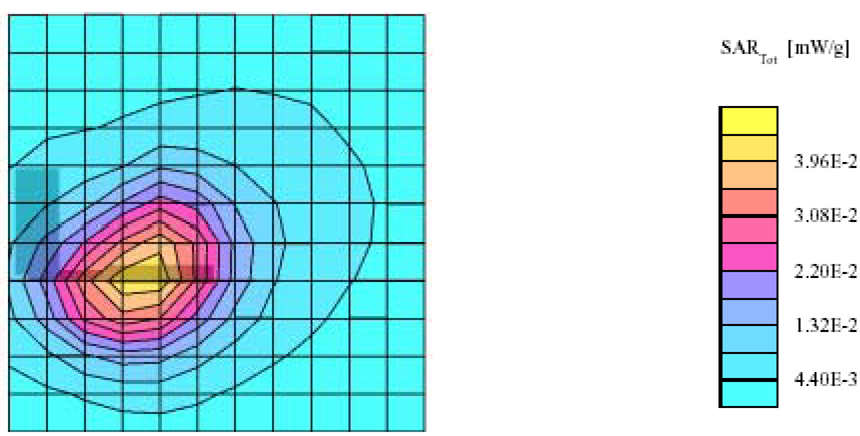
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 837 MHz
Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.220 mW/g, SAR (10g): 0.138 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 1.0
Powerdrift: -0.00 dB



Plot #2

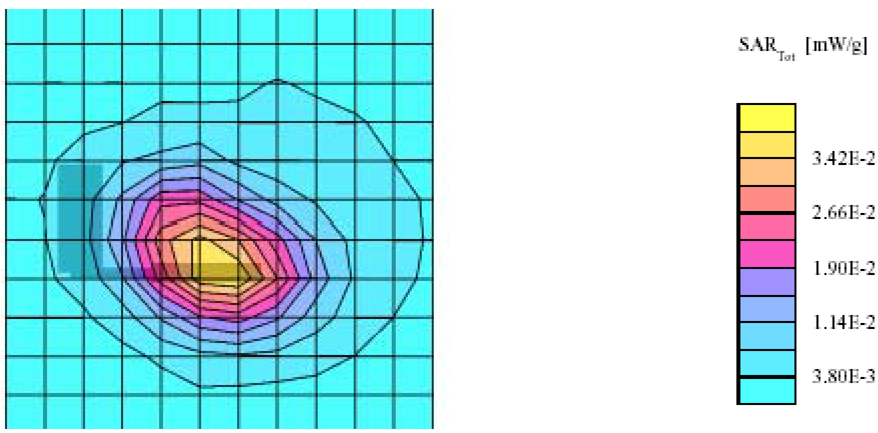
Mason Electronics, Model: MM-5500U (Notebook Model: Compacl, Side/bystander 1.5 cm separation, antenna parallel to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 837 MHz
Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.0428 mW/g, SAR (10g): 0.0280 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.03 dB



Plot #3

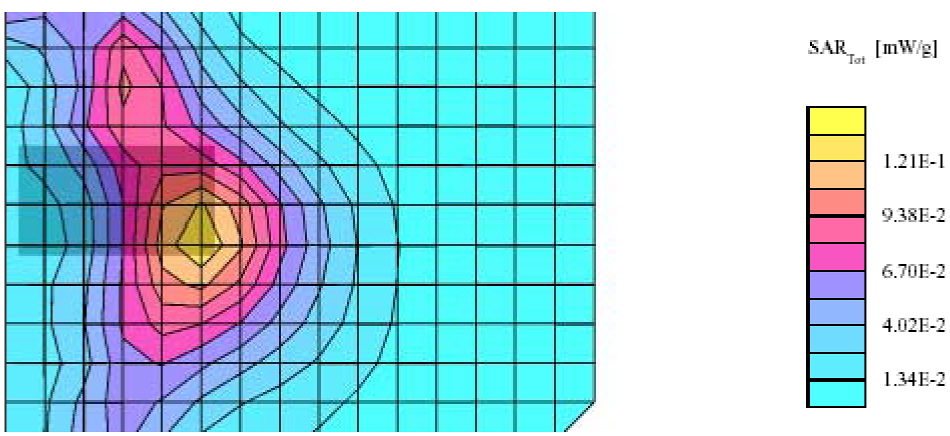
Mason Electronics, Model: MM-5500U (Notebook Model: Compacl, Side/bystander 1.5 cm separation, antenna parallel to phantom with headset, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 837 MHz
Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.0381 mW/g, SAR (10g): 0.0245 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.05 dB



Plot #4

Mason Electronics, Model: MM-5500U (Notebook Model: Dell, bottom side touch phantom, antenna pointing down and perpendicular to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

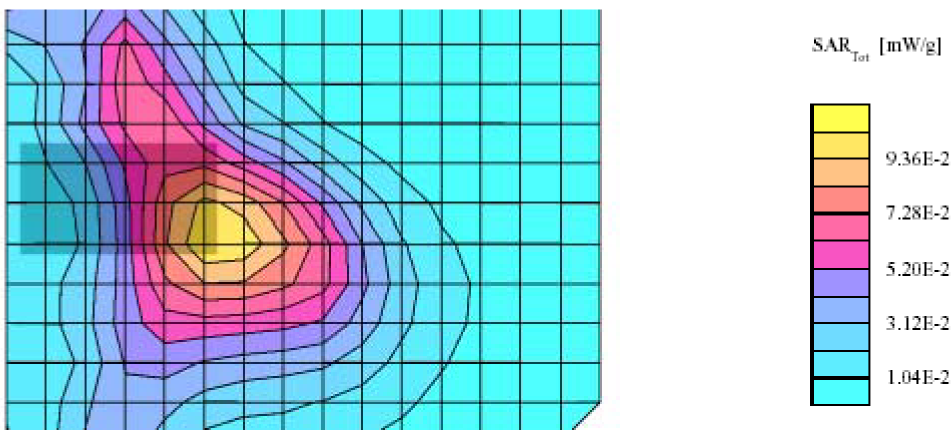
SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.129 mW/g, SAR (10g): 0.0872 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



Plot #5

Mason Electronics, Model: MM-5500U (Notebook Model: Dell, bottom side touch phantom, antenna pointing down and perpendicular to phantom with headset, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

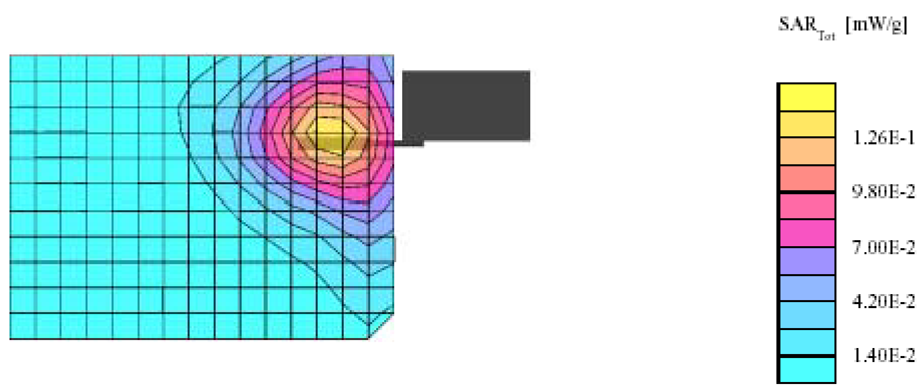
SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.101 mW/g, SAR (10g): 0.0695 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.03 dB



Plot #6

Mason Electronics, Model: MM-5500U (Notebook Model: Dell, bottom side touch phantom, antenna paraller to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

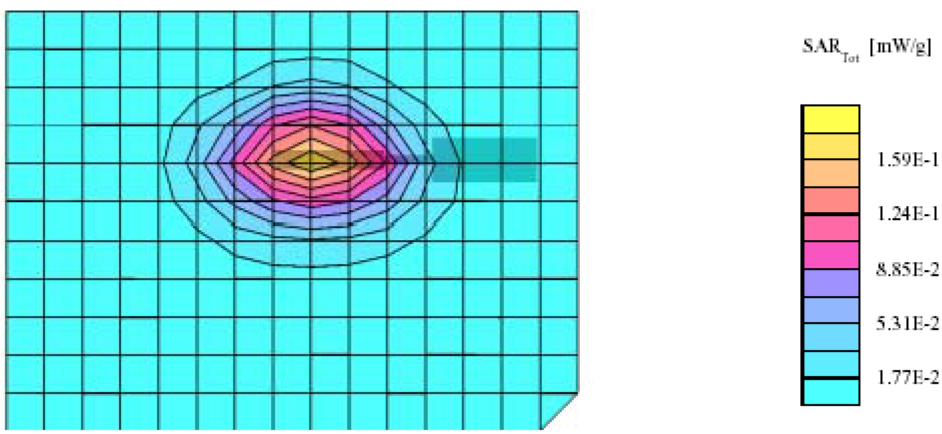
SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.137 mW/g, SAR (10g): 0.0949 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



Plot #7

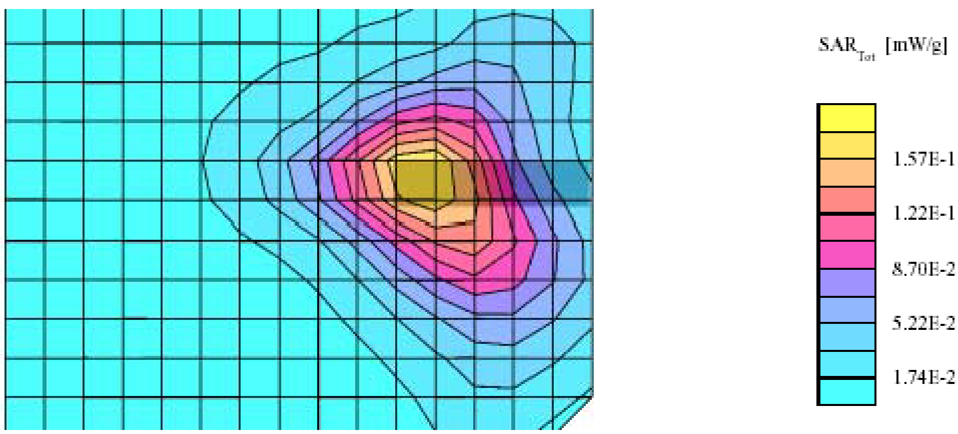
Mason Electronics, Model: MM-5500U (Notebook Model: Dell, Side/bystander 1.5 cm separation, antenna parallel to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.162 mW/g, SAR (10g): 0.101 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.01 dB



Plot #8

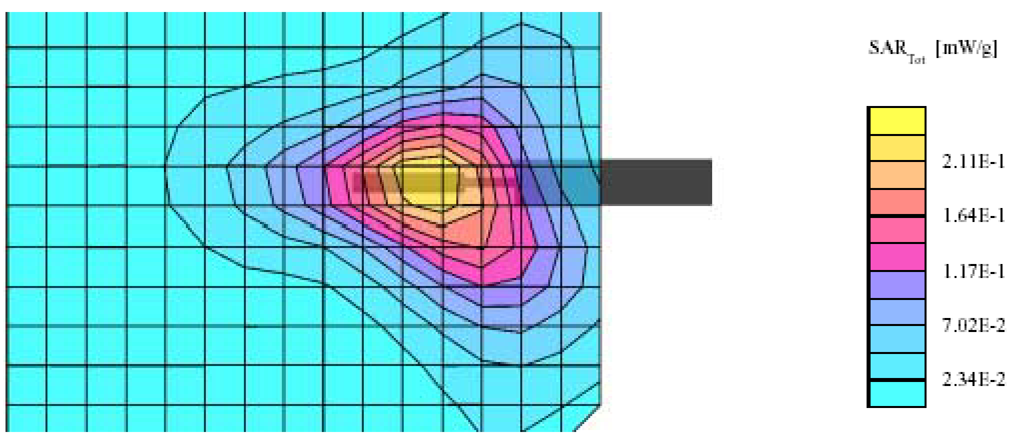
Mason Electronics, Model: MM-5500U (Notebook Model: Sony, bottom side touch phantom, antenna pointing down and perpendicular to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)
SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.179 mW/g, SAR (10g): 0.113 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



Plot #9

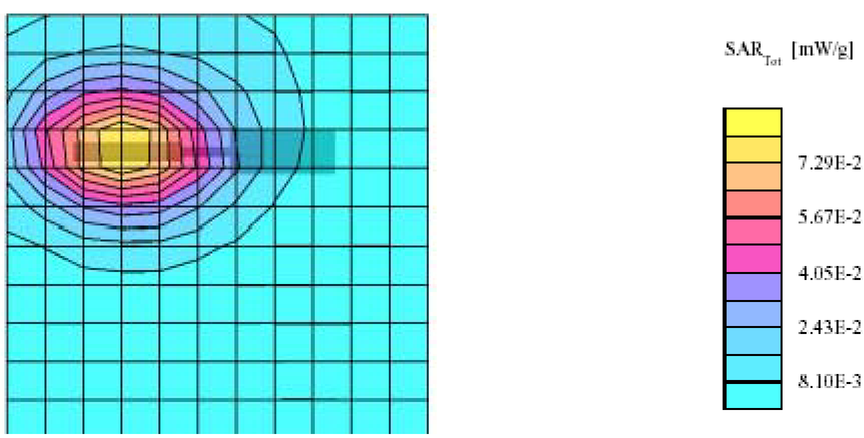
Mason Electronics, Model: MM-5500U (Notebook Model: Sony, bottom side touch phantom, antenna paraller to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.242 mW/g, SAR (10g): 0.152 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.01 dB



Plot #10

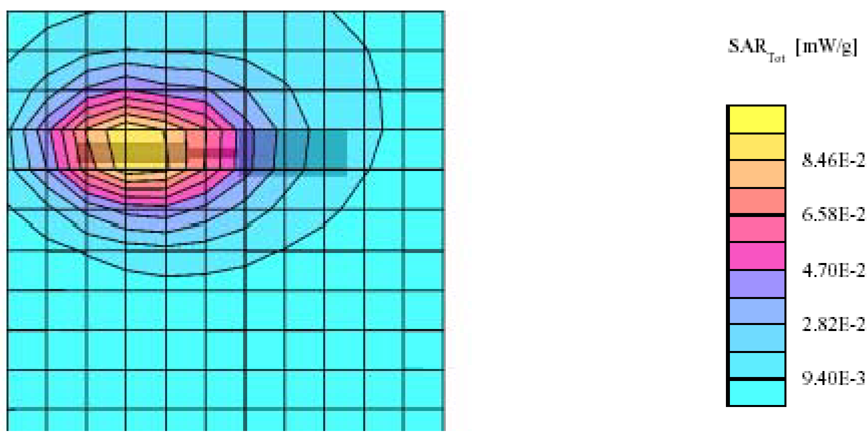
Mason Electronics, Model: MM-5500U (Notebook Model: Sony, Side/bystander 1.5 cm separation, antenna parallel to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)
SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.0774 mW/g, SAR (10g): 0.0504 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.00 dB



Plot #11

Mason Electronics, Model: MM-5500U (Notebook Model: Sony, Side/bystander 1.5 cm separation, antenna parallel to phantom with headset, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

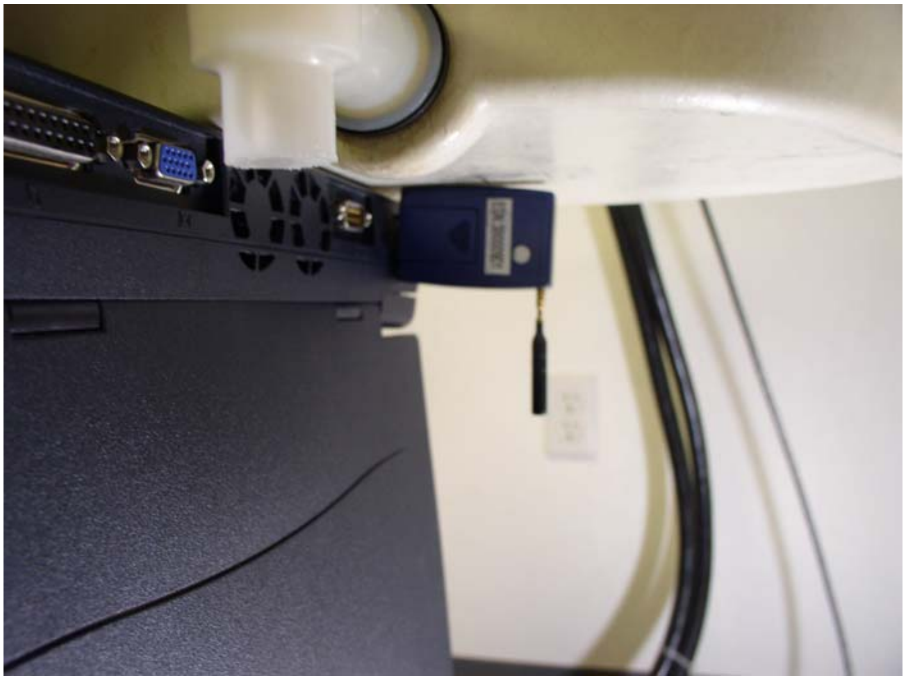
SAM Phantom; Flat Section; Position: (270°,90°); Frequency: 837 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.0966 mW/g, SAR (10g): 0.0622 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.00 dB



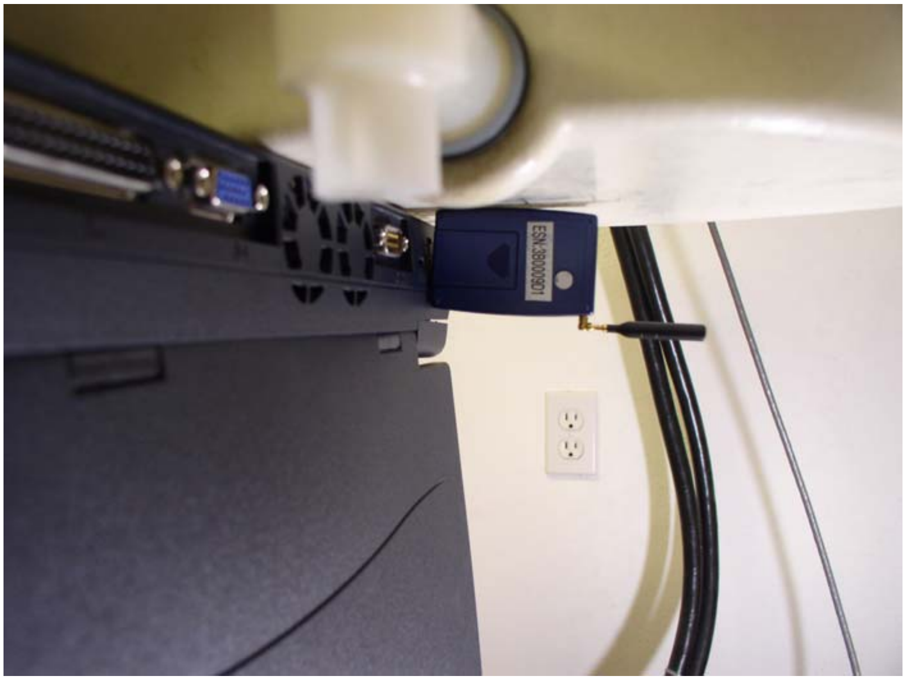
Plot #12

EXHIBIT A - SAR SETUP PHOTOGRAPHS

Compacl, Bottom side touching phantom, antenna pointing down and perpendicular with phantom



Compacl, Bottom side touching phantom, antenna parallel with phantom



Compacl, Side, By Stand, 1.5cm Separation with Phantom, Antenna parallel with phantom

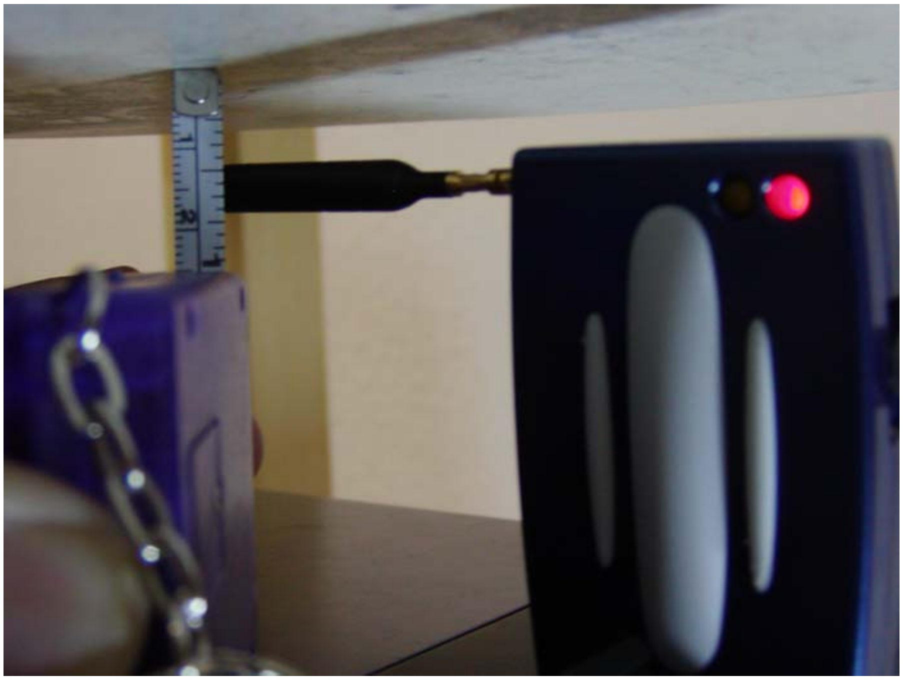
Compacl, Side, By Stander, 1.5cm Separation with Phantom, Antenna parallel with phantom, with headset

Dell, Bottom side touching phantom, antenna point down and perpendicular to phantom

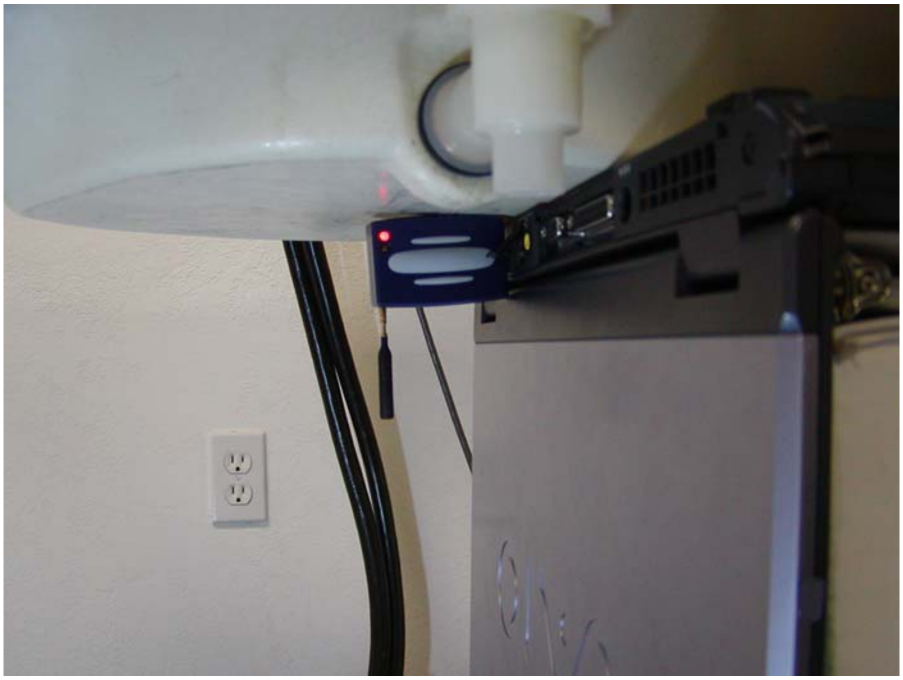
Dell, Bottom side touching phantom, antenna point down and perpendicular to phantom with headset

Dell, Bottom side touching phantom, antenna parallel to phantom

Dell, Side, By Stander, 1.5cm Separation with Phantom, antenna parallel to phantom

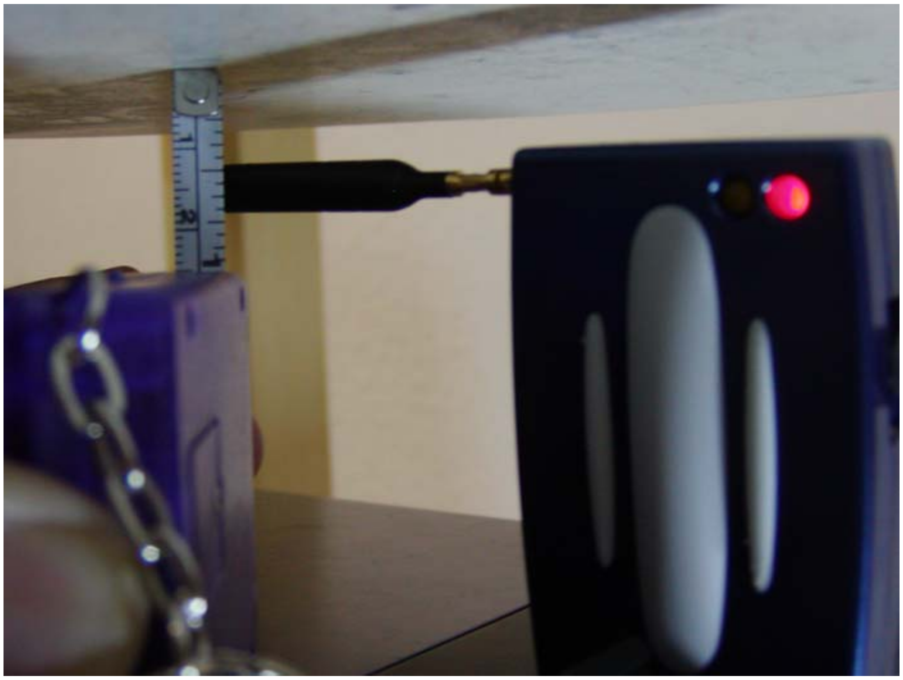


Sony, Bottom side touching phantom, antenna pointing down and perpendicular with phantom



Sony, Bottom side touching phantom, antenna parallel with phantom

Sony, Side, By Stand, 1.5cm Separation with Phantom, Antenna parallel with phantom



Sony, Side, By Stander, 1.5cm Separation with Phantom, Antenna parallel with phantom, with headset

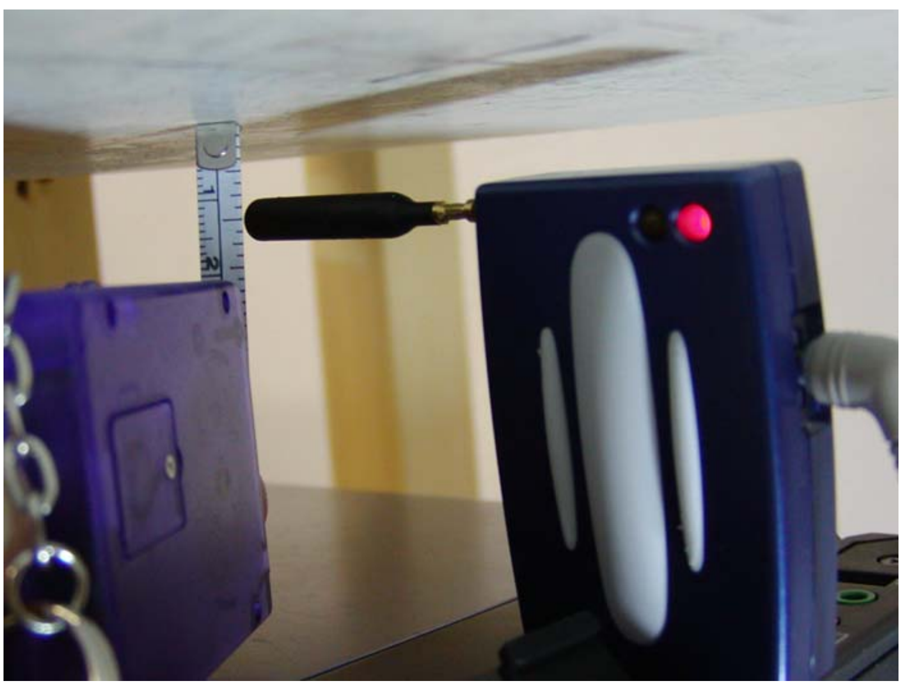
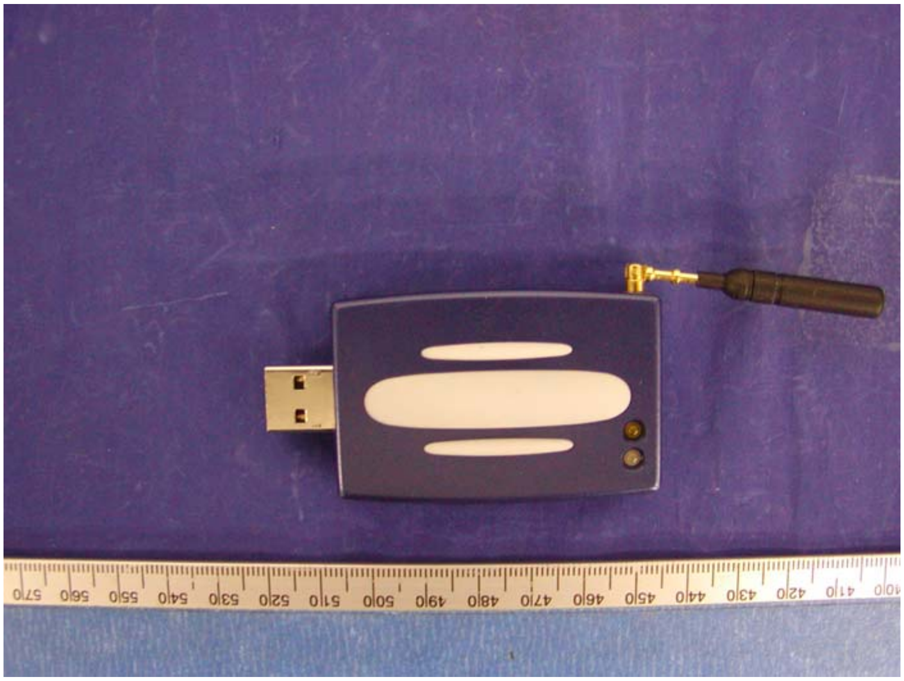


EXHIBIT B - EUT PHOTOGRAPHS

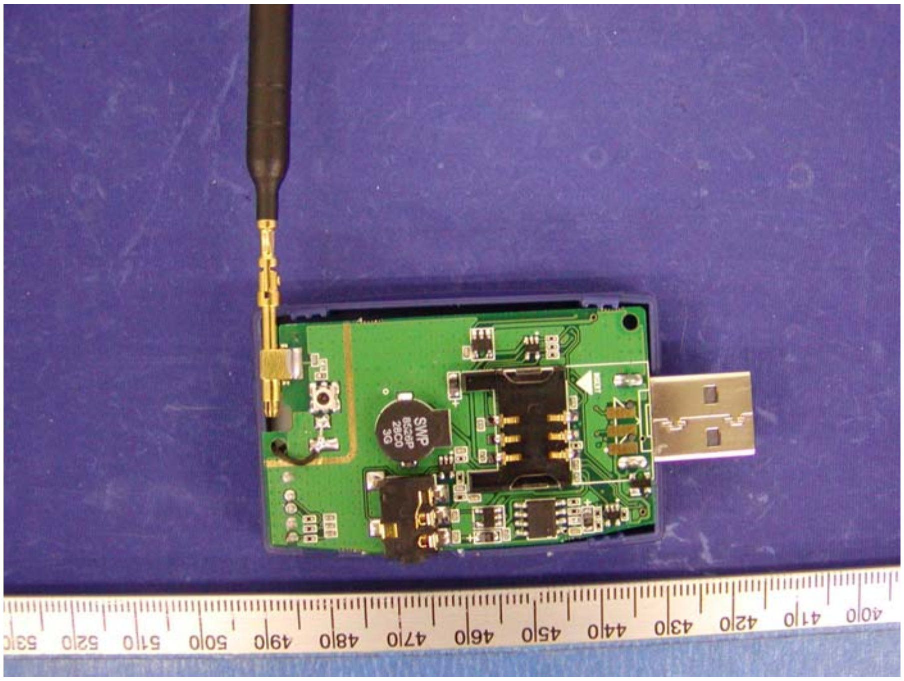
Chassis - Front View



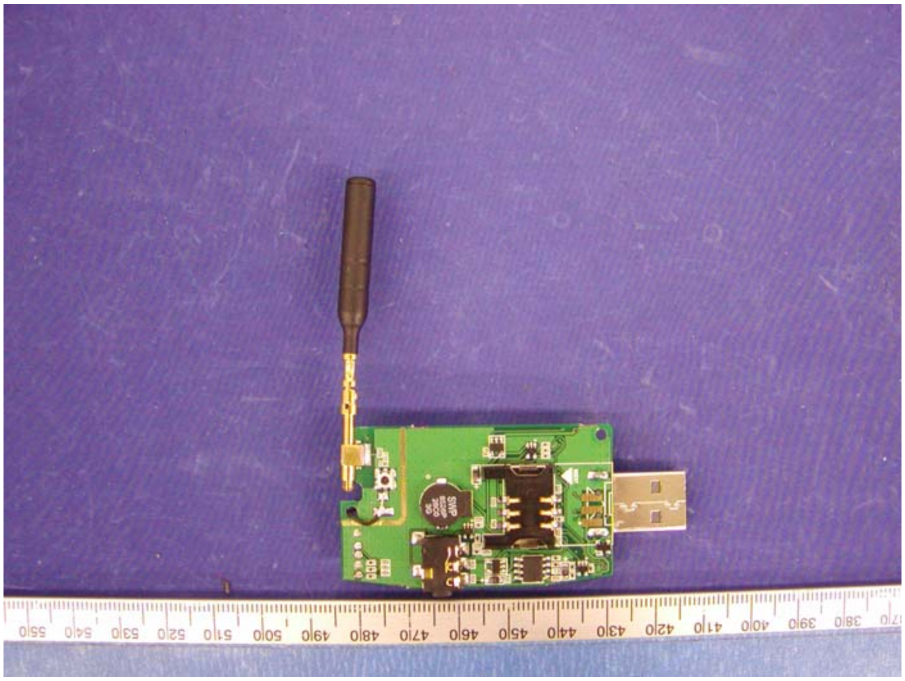
Chassis – Rear View

EUT & Host Notebook PC

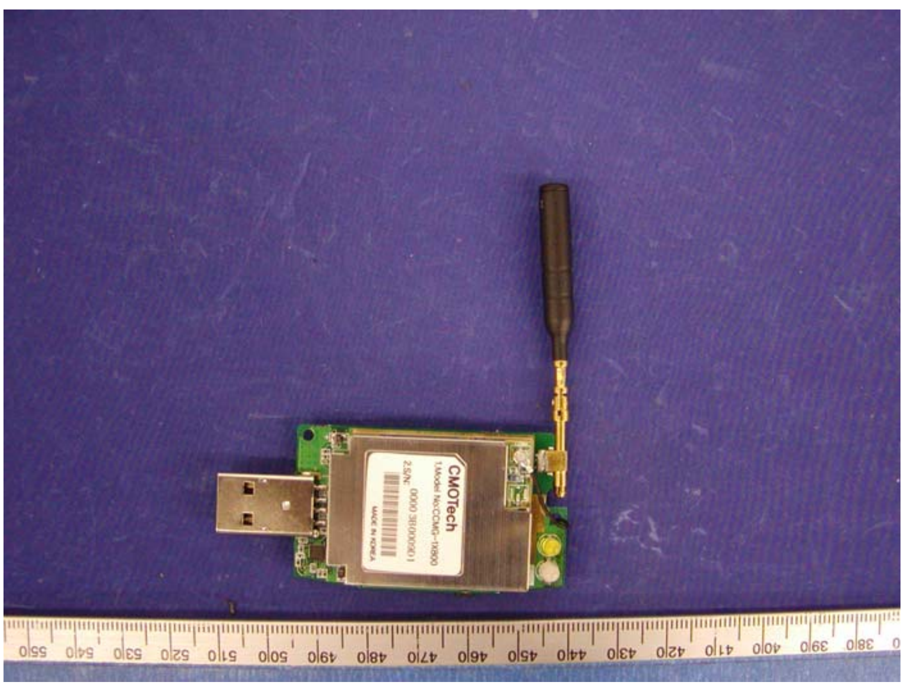
EUT – Board and Housing View



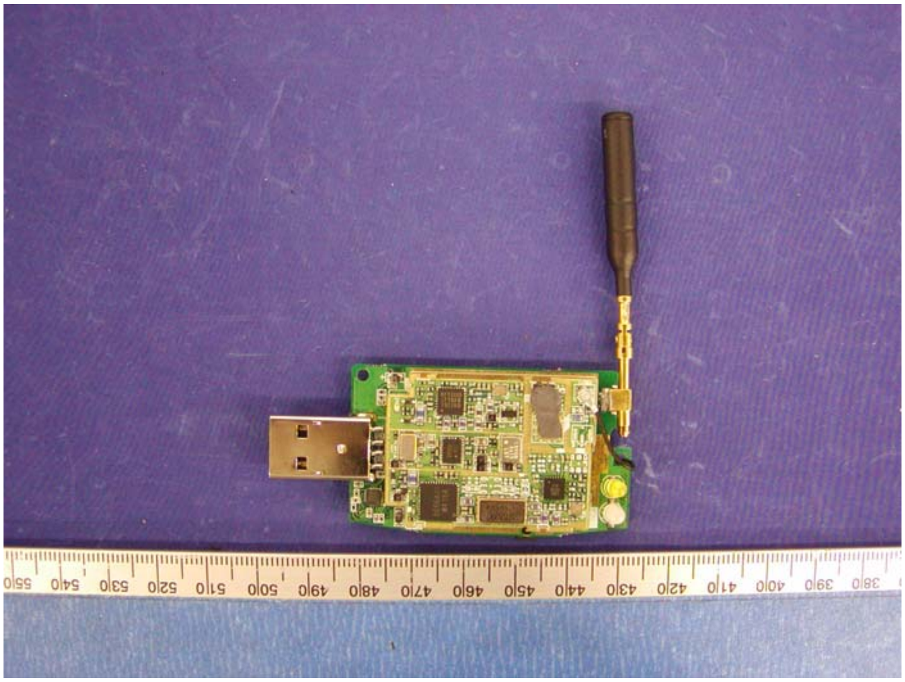
EUT – Main Board and Transmitter Board Top



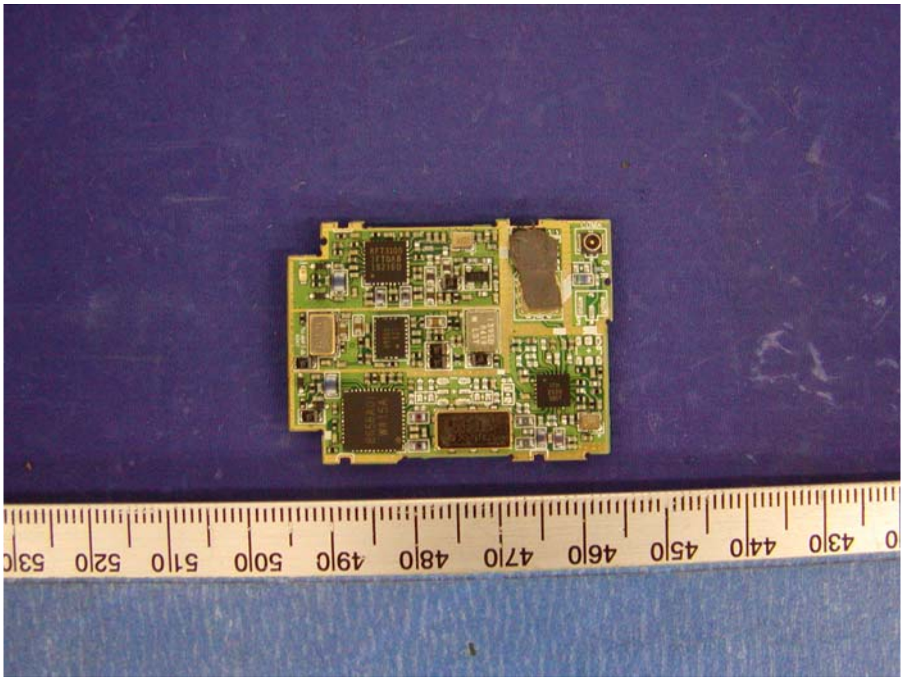
EUT – Main Board and Transmitter Board Bottom



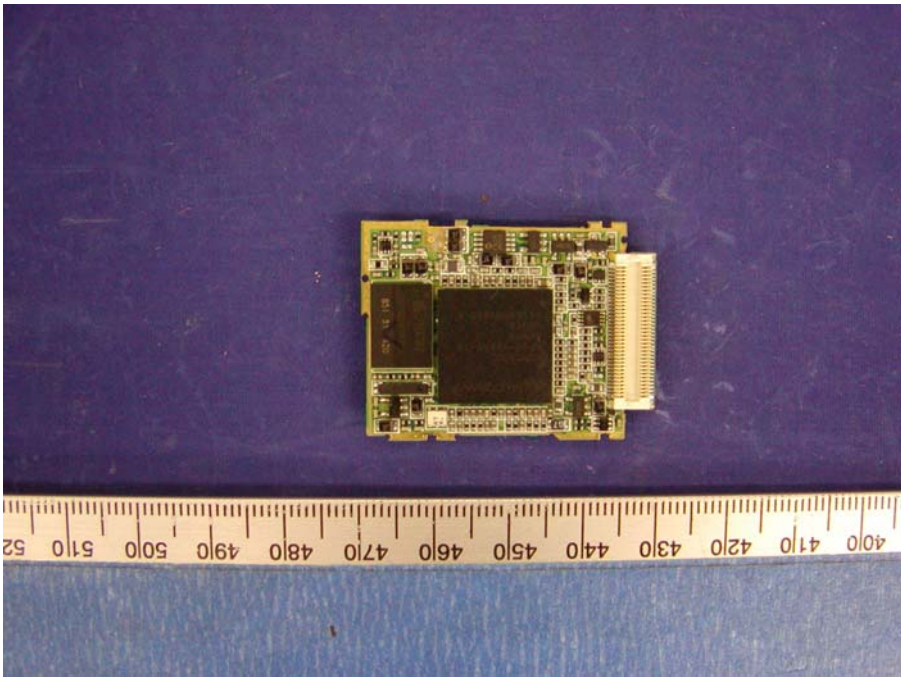
EUT – Main Board with Transmitter Board Cover Removed



EUT – Transmitter Board Cover Removed View



EUT – Transmitter Board Bottom View



EUT – Main Board Top View

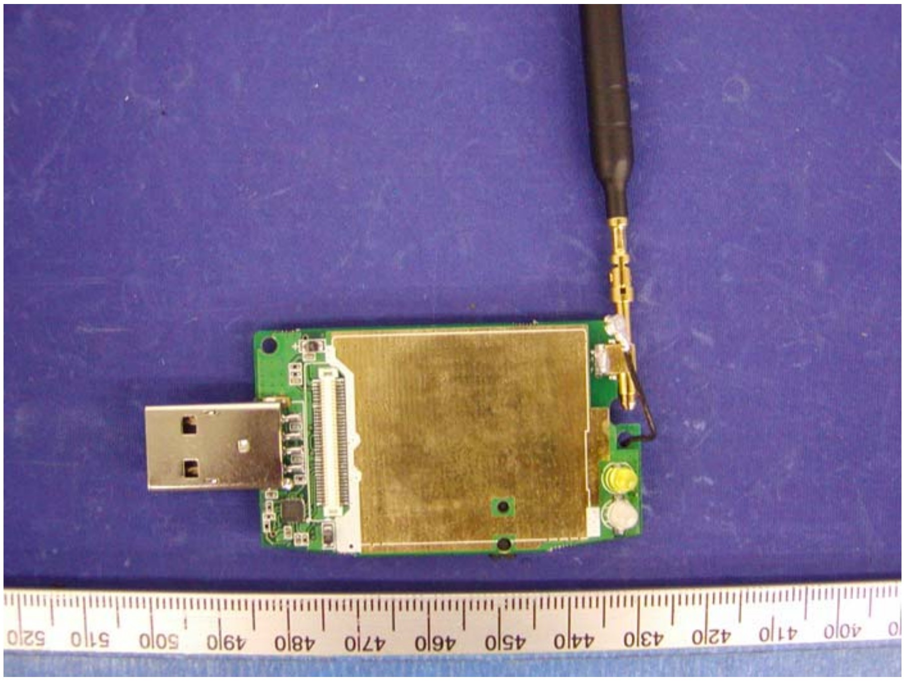


EXHIBIT C – Z-Axis

Mason Electronics, Model: MM-5500U (Notebook Model: Sony, bottom side touch phantom, antenna paraller to phantom, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 07/07/2004)

SAM Phantom; Section; Position: ; Frequency: 837 MHz

Probe: ET3DV6 - SN1604; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.96 mho/m ε_r = 54.8 ρ = 1.31 g/cm³

: , 0

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