MOTOROLA

ACCREDITED
Certificate Number: 1449-01

FCC ID: AZ489FT4826
DECLARATION OF COMPLIANCE SAR ASSESSMENT

Government & Enterprise Mobility Solutions
EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

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Report ID: FCC rpt PCII_PMUE1407A_Rev A_050801 SR2172

Responsible Engineer: Deanna Zakharia (Principle Staff EME Eng.)
Date/s Tested: 7/19/05 – 7/27/05
Manufacturer/Location: Motorola, Penang
Sector/Group/Div.: GEMS
Date submitted for test: 6/22/05
DUT Description: Portable transceiver 403-470MHz; 4W Conventional preferred keypad
Test TX mode(s): CW
Max. Power output: 6.0 W
Nominal Power: 4.0 W
Tx Frequency Bands: 403-470 MHz
Signaling type: FM
Model(s) Tested: PMUE1407A
Model(s) Certified: PMUE1407A
Serial Number(s): 749TYQ0146
Classification: Occupational/Controlled
Rule Part(s): 90

Applicable Accessories:

Antenna(s):
PMAE4003A - ¼ wave Helical; 430-470MHz; -4.5dBi

Battery(ies):
NNTN5332A Battery Shell (Holds 12 AA batteries)

Body-worn:
NTN8266B Beltclip

Audio Accessories
HMN9052E (Remote Speaker Microphone)

Max. Calc. 1-g/10-g Avg. SAR: 3.61/2.67mW/g (Body)
Max. Calc. 1-g/10-g Avg. SAR: 5.77/4.20mW/g (Face)

Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 2.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola EME Laboratory.

This reporting format is consistent with the test report guidelines of the TIA TSB-150 December 2004
The results and statements contained in this report pertain only to the device(s) evaluated.

Ken Enger signature on file
Ken Enger GEMS EME Lab Senior Resource Manager,
Laboratory Director,

Approval Date: 8/2/05

Certification Date: 8/2/05

Certification No.: 050707AD

1.0 Introduction and Overview 3
2.0 References, Standards, and Guidelines 3
2.1 SAR Limits 4
3.0 Description of Device Under Test (DUT) 4
4.0 Description of Test System 5
4.1 Description of Robotics/Probes/Readout Electronics 5
4.2 Description of Phantom(s) 5
4.3 Description of Equivalent Tissues 6
5.0 Additional Test Equipment 6
6.0 SAR Measurement System Verification 7
6.1 Equivalent Tissue Test results 7
6.2 System Check Test results 8
7.0 DUT Test Strategy and Methodology 8
7.1 Test Plan 8
7.2 Device Positioning Procedures 9
8.0 Environmental Test Conditions 9
9.0 Test Results Summary 10
9.1 Highest S.A.R. results calculation methodology 11
10.0 Conclusion 11

APPENDICES

A Measurement Uncertainty……12
B Probe Calibration Certificates……..15
C Dipole Calibration Certificates……29
D. Test System Verification Scans……35
E. DUT Scans (Shortened scans & highest SAR configurations)……46
F. DUT Supplementary Data (e.g. Power Slump)……50
G. DUT Test Position Photos…….…….....52

REVISION HISTORY

Date	Revision	Comments
7/16/04	O	Release of new battery accessories compliance results
8/01/05	A	Release of new battery accessory compliance results

1.0 Introduction and Overview

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (S.A.R.) measurements performed at the GEMS EME Test Lab for model numbers PMUE1407A, FCC ID: AZ489FT4826 using the new offered battery shell and belt clip accessories.

The test results presented herein clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8.0 mW/g** per the requirements of 47 CFR 2.1093(d).

2.0 Reference Standards and Guidelines

This product is designed to comply with the following national and international standards and guidelines.

- United States Federal Communications Commission, Code of Federal Regulations; Rule Part 47CFR § 2.1093 sub-part J:1999
- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- IEEE 1528, 2003 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques"
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2003
- ANATEL, Brazil Regulatory Authority, Resolution No. 303 of July 2, 2002 "Regulation of the limitation of exposure to electrical, magnetic, and electromagnetic fields in the radio frequency range between 9KHz and 300 GHz." and “Attachment to resolution # 303 from July 2, 2002”

2.1 SAR Limits

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	**0.4**
Spatial Peak (averaged over any 1-g of tissue)	1.60	**8.0**
Spatial Peak (hands/wrists/feet/ankles averaged over 10-g)	4.0	**20.0**
Localized SAR (Head and Trunk 10-g)	2.0	**10.0**

3.0 Description of Device Under Test (DUT)

FCC ID: AZ489FT4826 is a conventional portable transceiver with a keypad that utilizes frequency modulation (FM). Normal operational use is 5% TX, 5% RX, and 90% stand by. The radio's functional use is at the face in PTT mode or at the body using optional body worn and audio accessories.

This device will be marketed to and used by the controlled population. This device may be used while held in front of the face in PTT mode, and against the body in PTT mode.

This device will be marketed to and used by employees solely for work-related operations, such as public safety agencies, e.g. police, fire and emergency medical. User training is the responsibility of these agencies that are expected to employ the usage instructions, safety information and operational cautions set forth in the user's manual, instructional sessions or other means. Motorola also makes available to its customers training classes on the proper use of two-way radios.

FCC ID: AZ489FT4826 operates in the 403-470MHz band. The rated power is 4 watts with a maximum output capability of 6.0 watts as defined by the upper limit of the production line final test station.

Test Output Power

A table of the characteristic power slump versus time is provided in Appendix F.

4.0 Description of Test System

4.1 Descriptions of Robotics/probes/Readout Electronics

The laboratory utilizes a Dosimetric Assessment System (DASY4™) S.A.R. measurement system Version 4.5 B19.2 manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The test system consists of a Stäubli RX90L robot with ET3DV6 and EX3DV3 E-Field probes. Please reference the SPEAG user manual and application notes for detailed probe, robot, and S.A.R. computational procedures. Section 5.0 presents relevant test equipment information. Appendices B and C present the applicable calibration certificates. The E-field probe first scans a coarse grid over a large area inside the phantom in order to locate the interpolated maximum S.A.R. distribution. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The subsequent scan can directly use this position as reference for the cube evaluations.

4.2 Description of Phantom(s)

4.2.1 Flat Phantom

Phantom Type	Phantom Material	Phantom Dimensions (cm)	Support structure opening dimensions (cm)	Support structure material	Loss Tangent (wood)
Flat	High Density Polyethylene (HDPE)	80x30x20x0.2	68.58x20.32	Wood	< 0.05

4.2.2 SAM Phantom

Phantom Type	Material Parameters	Material Thickness (mm)	Support structure material	Loss Tangent (wood)
NA	200MHz -3GHz; Er = <5, Loss Tangent = <0.05	2mm +/- 0.2mm	Wood	< 0.05

4.3 Description of Equivalent tissues

Type of Simulated Tissue

The simulated tissue used is compliant to that specified in FCC Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) and IEEE 1528, 2003 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques" The simulated tissue is produced by placing the correct measured amount of De-ionized water into a large container. Each of the dried ingredients are weighed and added to the water carefully to avoid clumping. If the solution has a high sugar concentration the water is pre-heated to aid in dissolving the ingredients. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

4.3.2 Simulated Tissue Composition

% of listed ingredients	450MHz	
	Head	Body
Sugar	56	47.1
DGBE (Glycol)	NA	NA
Diacetin	NA	NA
De ionized - Water	39.1	50.53
Salt	3.8	1.87
HEC	1	1
Bact.	0.1	0.1

Reference section 6.1 for target parameters

5.0 Additional Test Equipment

Equipment Type	Model Number	Serial Number	Calibration Due Date
Power Meter	437B	3125U16028	9/29/2005
Power Meter	437B	3737U26425	11/1/2005
Sensor	8482B	3318A07392	11/22/2005
Sensor	8481H	2703A14631	9/29/2005
Power Meter	E4418B	GB40206480	11/22/2005
Sensor	8482B	3318A07546	9/27/2005
Directional Coupler (NARDA)	3020A	40295	18-Jul-06
Sig Gen	E4421B	RSHPBT02	11/3/2005
AMP (Amplifier Research)	1W1000	16625	CNR
Tissue Station			
Network Analyzer (HP)	8753D	3410A06417	7-Feb-06
Dielectric Probe Kit (HP)	85070C	US99360076	CNR

6.0 SAR Measurement System Verification

The S.A.R. measurements were conducted with probe model/serial number ET3DV6/SN1383. The system performance check was conducted daily and within 24 hours prior to testing. DASY output files of the system performance test results and the probe/dipole calibration certificates are included in appendices B, C and D respectively. The table below summarizes the system performance check results normalized to 1W.
Dipole validation scans at the head from SPEAG are provided in Appendix D. The GEMS EME lab validated the dipole to the applicable IEEE system performance targets. Within the same day system validation was performed using FCC body tissue parameters to generate the system performance target values for body at the applicable frequency. The results of the GEMS EME system performance validation are provided herein.

6.1 Equivalent Tissue Test Results

Simulated tissue prepared for S.A.R. measurements is measured daily and within 24 hours prior to actual S.A.R. testing to verify that the tissue is within 5% of target parameters at the center of the transmit band. This measurement is done using the Agilent (HP) probe kit model 85070C and a HP8753D Network Analyzer.

Target versus measured tissue parameters (7/19/05 - 7/27/05)

FCC Body				
Frequency (MHz)	**Di-electric Constant Target**	**Di-electric Constant Meas. (Range)**	**Conductivity Target S/m**	**Conductivity Meas. (Range) S/m**
450	56.7	55.5-55.6	0.94	0.93-0.93
436	56.8	55.6-55.9	0.94	0.92-0.92

IEEE Head				
Frequency (MHz)	**Di-electric Constant Target**	**Di-electric Constant Meas. (Range)**	**Conductivity Target S/m**	**Conductivity Meas. (Range) S/m**
450	43.5	43.6-44.2	0.87	0.85-0.88
436	43.7	43.8-44.4	0.87	0.86-0.87

6.2 System Check Test Results

Probe Serial #	Tissue Type	Probe Cal Date	Dipole Kit / Serial #	System Perf. Result when normalized to 1W (mW/g)	Reference S.A.R @ 1W (mW/g)	Test Date(s)
1383	FCC Body	2/24/05	DV450V2/1002	5.15 +/- 0.0	5.26 +/- 10%	7/21/05
1383	IEEE Head	2/24/05	DV450V2/1002	5.2 +/- 0.04	5.13 +/- 10%	7/19/05, 7/20/05 & 2/27/05

Note: See Appendix D for an explanation of the reference S.A.R. targets stated above.
(System performance results reflects the median performance +/- ½ of the test date(s) performance ranges)

The DASY4™ system is operated per the instructions in the DASY4™ Users Manual. The complete manual is available directly from SPEAG™. All measurement equipment used to assess EME S.A.R. compliance was calibrated according to 17025 A2LA guidelines.

7.0 DUT Test Strategy and Methodology

DUT Configuration

PTT operation using Frequency Modulation (FM) in CW transmission mode
The DUT's PTT switch is engaged and the radio is placed in the reported test positions presented in Appendix G.

7.1 Test Plan

All options and accessories listed on the cover page and sec 3.0 of this report were considered in order to develop the S.A.R. test plan for this product. S.A.R. measurements were performed using a flat phantom with the applicable simulated tissue to assess performance at the body and face using CW transmission mode.
Note that a coarse-to-cube approximation methodology was utilized to determine the worst-case S.A.R. performance configuration for each applicable body location. The test configurations that produced the highest S.A.R. results for each body position using the coarse-to-cube approximation methodology were assessed using the full DASY4™ coarse and 7x7x7 cube scans.

Assessments at the Body **[Page 10 of 43; Table 1]**

- Assessment of new offered battery shell and belt clip using the relevant worst case test configurations at the body from the previous filing.

Assessments at the face **[Page 11 of 43; Table 2]**

- Assessment of new offered battery shell and belt clip using the relevant worst case test configurations from the previous filing.

Shortened scan assessment at the face [Appendix E]
A "shortened" scan was performed using the test configuration that produced the highest S.A.R. results overall at the body and the face. Note that the shortened scan is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, perform a cube scan only. The shortened scan represents the cube scan performance results.

7.2 Device Positioning Procedures

Reference Appendix G for photos of the DUT tested positions.

7.2.1 Body

The DUT was positioned at the center of the flat phantom with the belt clip flat against the bottom. Attached audio accessories are allowed to hang straight down from the radio.

7.2.2 Head

NA

7.2.3 Face

The DUT was positioned at the center of the flat phantom with a 2.5cm separation distance from the front housing.

8.0 Environmental Test Conditions

The EME Laboratory ambient environment is well controlled resulting in very stable simulated tissue temperature and therefore stable dielectric properties. Simulated tissue temperature is measured prior to each scan to insure it is within +/ - 2°C of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was 15cm +/- 0.5cm. Additional precautions are routinely taken to ensure the stability of the simulated tissue such as covering the phantoms when scans are not actively in process in order to minimize evaporation. The lab environment is continuously monitored. The table below presents the range and average environmental conditions during the S.A.R. tests reported herein:

	Target	Measured
Ambient Temperature	20 - 25 ˚C	Range: 20.4-21.9˚C Avg. 21.24˚C
Relative Humidity	30 - 70 %	Range: 50.1-56.4% Avg. 52.36%
Tissue Temperature	NA	Range: 20.3-21.8˚C Avg. 21.5 ˚C

The EME Lab RF environment uses a Spectrum Analyzer to monitor for extraneous large signal RF contaminants that could possibly affect the test results. If such unwanted signals are discovered the S.A.R scans are repeated. However, the lab environment is sufficiently protected such that no S.A.R. impacting interference has been experienced to date.

9.0 Test Results Summary

All S.A.R. results obtained by the tests described in Section 7.1 are listed below. As noted in section 7.1, a coarse-to-cube approximation methodology, was utilized to ascertain the worst-case test configuration for each body location. The worst case test configurations observed for each body location were then assessed using the full DASY4™ coarse and 7x7x7 cube methodology, and they are presented as bolded results. The associated S.A.R. plots are provided in Appendix E. Appendix E also presents a shortened S.A.R. cube scan to assess the validity of the calculated results presented herein. Note: The results of the shortened cube scan presented in Appendix E, demonstrates that the scaling methodology used to determine the calculated S.A.R. results presented herein are valid.

Table1

DUT assessment at the body; CW mode												
Run Number/ SN	**Antenna**	**Freq. (MHz)**	**Battery**	**Test position**	**Carry Case**	**Additional attachments**	**Initial Power (W)**	**S.A.R. Drift (dB)**	**Meas. 1g-S.A.R. (mW/g)**	**Meas. 10g-S.A.R. (mW/g)**	**Max Calc. 1g-S.A.R. (mW/g)**	**Max Calc. 10g-S.A.R. (mW/g)**
Assessment of new offered battery shell (AA)/belt clip with antenna model PMAE4003A												
***CM-Ab-050721-03/749TYQ0146**	PMAE4003A	433.025	NNTN5332A w/AA batteries	Against phantom	NTN8266B	HMN9052E	4.35	-0.749	4.82	3.56	3.95	2.92
CM-Ab-050727-12/749TYQ0146	PMAE4003A	455.025	NNTN5332A w/AA batteries	Against phantom	NTN8266B	HMN9052E	3.95	-0.818	3.00	2.19	2.75	2.01
CM-Ab-050721-06/749TYQ0146	PMAE4003A	469.975	NNTN5332A w/AA batteries	Against phantom	NTN8266B	HMN9052E	4.39	-0.538	2.83	2.06	2.19	1.59
***Assessment with the worst case test configuration above using the full DASY 4 coarse and 7x7x7 cube scan measurements.**												
CM-Ab-050721-10/749TYQ0146	PMAE4003A	433.025	NNTN5332A w/AA batteries	Against phantom	NTN8266B	HMN9052E	4.35	-0.898	4.260	3.150	3.61	2.67

Table 2

DUT assessment at the Face; CW mode												
Run Number/ SN	**Antenna**	**Freq. (MHz)**	**Battery**	**Test position**	**Carry Case**	**Additional attachments**	**Initial Power (W)**	**S.A.R. Drift (dB)**	**Meas. 1g-S.A.R. (mW/g)**	**Meas. 10g-S.A.R. (mW/g)**	**Max Calc. 1g-S.A.R. (mW/g)**	**Max Calc. 10g-S.A.R. (mW/g)**
Assessment of new offered battery shell (AA)/belt clip with antenna model PMAE4003A												
***CM-Face-050719-03/749TYQ0146**	PMAE4003A	433.025	NNTN5332A w/AA batteries	DUT front @ 2.5cm	NTN8266B	None	4.27	-0.767	6.050	4.490	5.07	3.76
CM-Face-050727-11/749TYQ0146	PMAE4003A	455.025	NNTN5332A w/AA batteries	DUT front @ 2.5cm	NTN8266B	None	3.93	-0.849	5.13	3.81	4.76	3.54
CM-Face-050720-07/749TYQ0146	PMAE4003A	469.975	NNTN5332A w/AA batteries	DUT front @ 2.5cm	NTN8266B	None	4.39	-0.514	4.800	3.560	3.69	2.74
***Assessment with the worst case test configuration above using the full DASY 4 coarse and 7x7x7 cube scan and Shorten Scan measurements.**												
CM-Face-050719-04/749TYQ0146	PMAE4003A	433.025	NNTN5332A w/AA batteries	DUT front @ 2.5cm	NTN8266B	None	4.17	-1.12	5.970	4.30	5.56	4.00
(Shorten Scan) CM-Face-050720-08/749TYQ0146	PMAE4003A	433.025	NNTN5332A w/AA batteries	DUT front @ 2.5cm	NTN8266B	None	4.34	-0.547	7.36	5.36	5.77	4.20

9.1 Highest S.A.R. results calculation methodology

The calculated maximum 1-gram and 10-gram averaged S.A.R. results reported herein for the full DASY 4™ coarse and 7x7x7 cube measurements are determined by scaling the measured S.A.R. to account for power leveling variations and power slump. For this device the Maximum Calculated 1-gram and 10-gram averaged peak S.A.R. is calculated using the following formula:

Max. Calc. 1-g/10-g Avg. SAR = ((S.A.R. meas. / (10^(Pdrift/10)))*(Pmax/Pint))* DC%
P_{max} = Maximum Power (W)
P_{int} = Initial Power (W)
Pdrift = DASY drift results (dB) - (for conservative results positive drifts are not accounted for)
$SAR_{meas.}$ = Measured 1 gram averaged peak S.A.R. (mW/g)
DC % = Transmission mode duty cycle in % where applicable
50% duty cycle is applied for PTT operation.

10.0 Conclusion

The highest Operational Maximum Calculated 1-gram and 10-gram average S.A.R. values found for FCC ID: AZ489FT4826 model PMUE1407A.

At the Body: 1-g Avg. = 3.61mW/g; 10-g Avg. = 2.67mW/g
At the Face: 1-g Avg. = 5.77mW/g; 10-g Avg. = 4.20mW/g

These test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8.0 mW/g** per the requirements of 47 CFR 2.1093(d).

APPENDIX A
Measurement Uncertainty

Uncertainty Budget for Device Under Test, for 30 MHz to 3 GHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	IEEE 1528 section	**Tol. (± %)**	**Prob Dist**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.4	N	1.00	1	1	3.4	3.4	29
Device Holder Uncertainty	E.4.1	3.8	N	1.00	1	1	3.8	3.8	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				11	11	506
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				22	22	

Uncertainty Budget for System Performance Check (dipole & flat phantom) for 30 MHz to 3 GHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	IEEE 1528 section	**Tol. (± %)**	**Prob. Dist.**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t. Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	∞
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	∞
Combined Standard Uncertainty			RSS				9	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k* =2				18	17	

Notes for Tables 1 and 2
a) Column headings *a-k* are given for reference.
b) Tol. - tolerance in influence quantity.
c) Prob. Dist. – Probability distribution
d) N, R - normal, rectangular probability distributions
e) Div. - divisor used to translate tolerance into normally distributed standard uncertainty
f) *ci* - sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
g) *ui* – SAR uncertainty
h) *vi* - degrees of freedom for standard uncertainty and effective degrees of freedom for the expanded uncertainty.

Appendix B
Probe Calibration Certification

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Motorola CGISS**

Certificate No: **ET3-1383_Feb05**

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1383
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	February 24, 2005
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-May-04 (METAS, No. 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No. 251-00388)	May-05
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-04 (METAS, No. 251-00403)	Aug-05
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-04 (METAS, No. 251-00389)	May-05
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-04 (METAS, No. 251-00404)	Aug-05
Reference Probe ES3DV2	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
DAE4	SN: 617	19-Jan-05 (SPEAG, No. DAE4-617_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Laboratory Technician	N. Vetterli
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 25, 2005

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 SN:1383 February 24, 2005

DASY - Parameters of Probe: ET3DV6 SN:1383

Sensitivity in Free Space[A]

NormX	**1.86** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**90** mV
NormY	**1.60** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**90** mV
NormZ	**1.67** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**90** mV

Diode Compression[B]

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	10.3	5.2
SAR_{be} [%]	With Correction Algorithm	0.7	0.1

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	14.9	9.6
SAR_{be} [%]	With Correction Algorithm	0.9	0.1

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm
Optical Surface Detection	**very low, but repeatable**

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

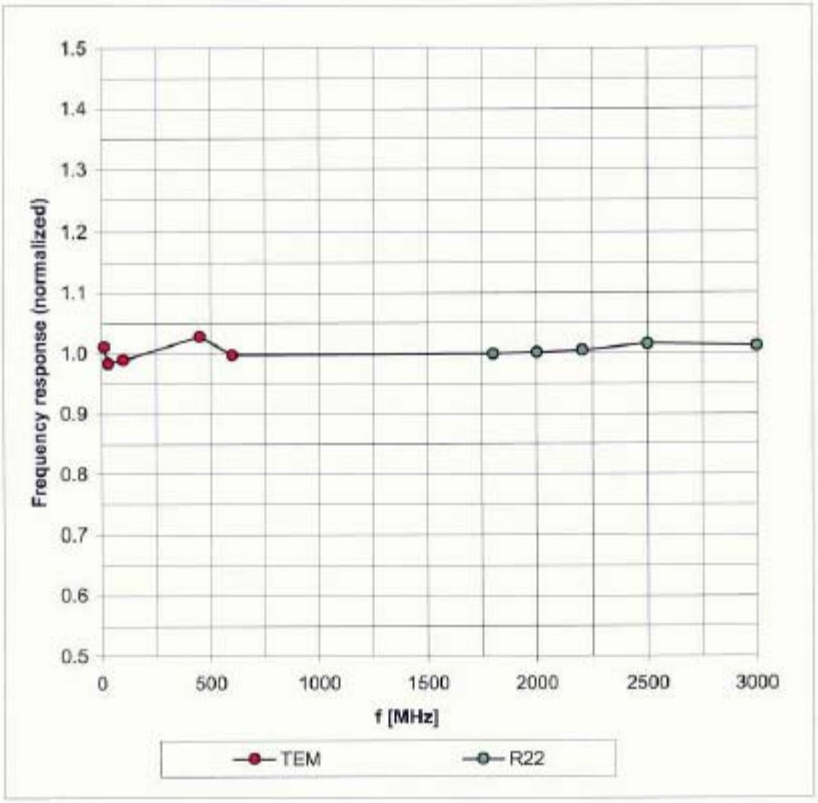
[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1383 February 24, 2005

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

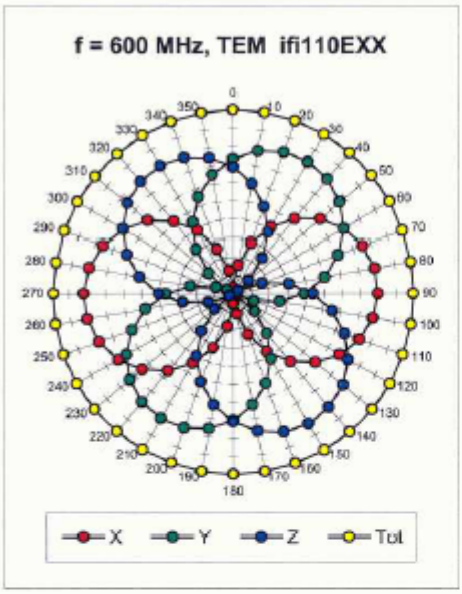


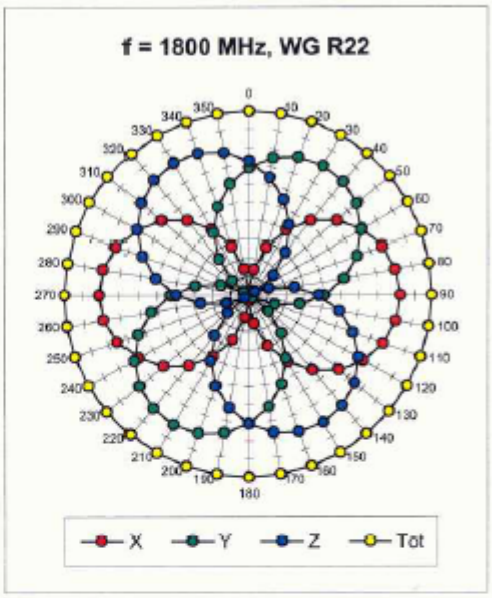
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

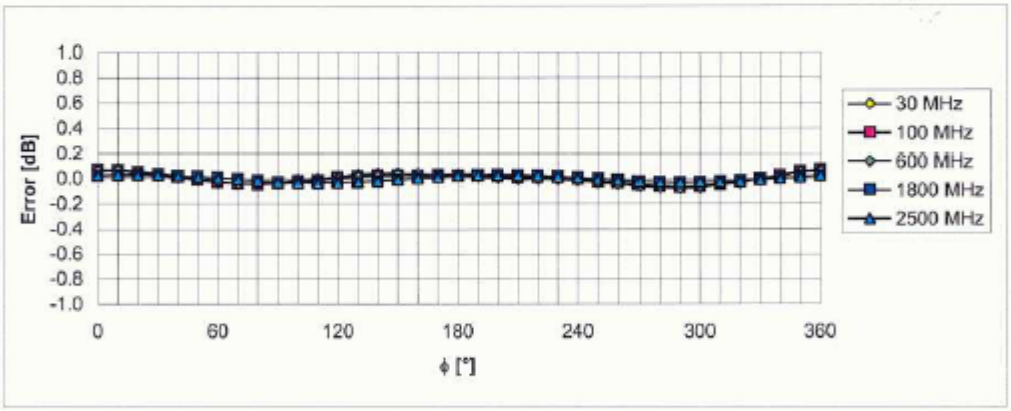
Certificate No: ET3-1383_Feb05 Page 5 of 9

ET3DV6 SN:1383 February 24, 2005

Receiving Pattern (ϕ), ϑ = 0°







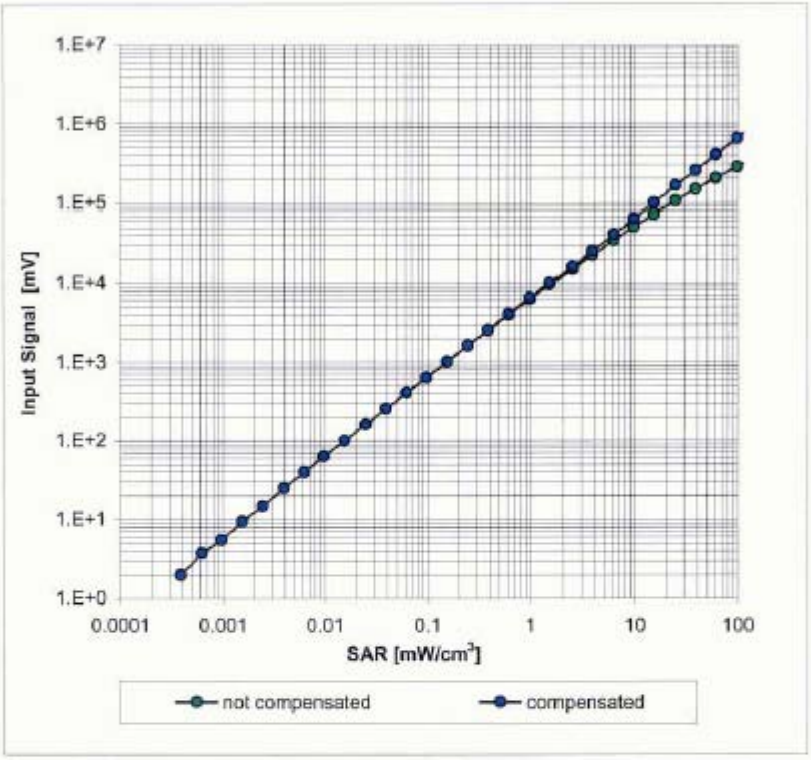
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

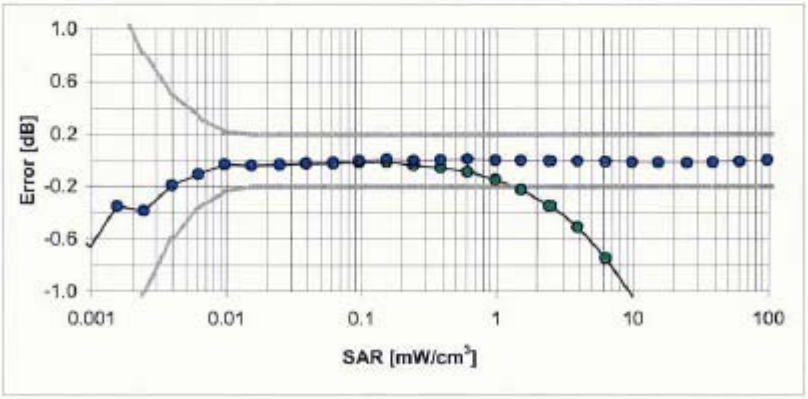
Certificate No: ET3-1383_Feb05 Page 6 of 9

ET3DV6 SN:1383 February 24, 2005

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)



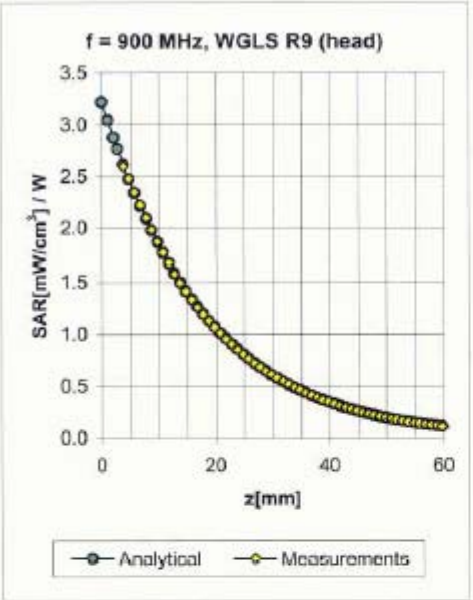


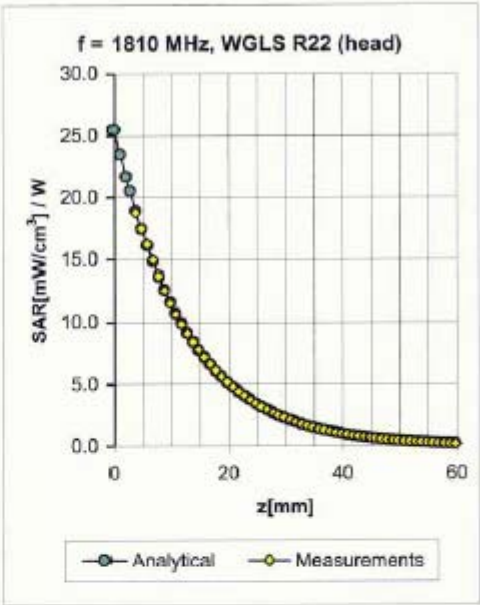
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: ET3-1383_Feb05 Page 7 of 9

ET3DV6 SN:1383 February 24, 2005

Conversion Factor Assessment





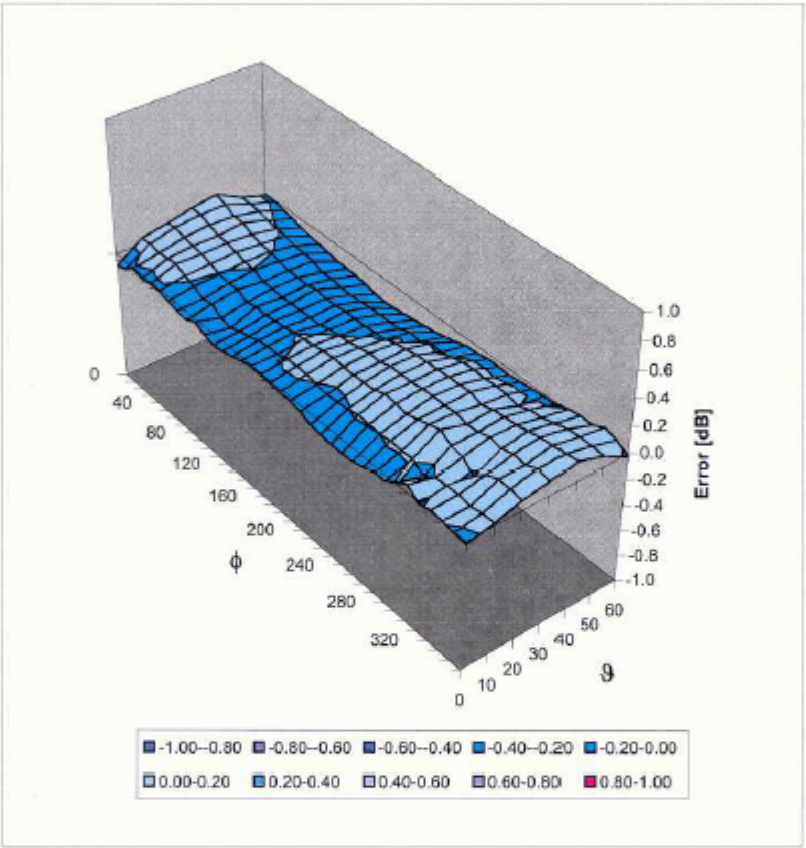
f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
300	± 50 / ± 100	Head	45.3 ± 5%	0.87 ± 5%	0.13	1.55	7.96 ± 13.3% (k=2)
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.12	1.15	7.26 ± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.44	1.38	6.35 ± 11.0% (k=2)
1450	± 50 / ± 100	Head	40.5 ± 5%	1.20 ± 5%	1.03	1.72	5.69 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.76	2.16	5.26 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.87	2.04	4.59 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.09	1.13	7.05 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	1.40	1.46	6.03 ± 11.0% (k=2)
1450	± 50 / ± 100	Body	54.0 ± 5%	1.30 ± 5%	0.88	2.03	5.22 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.73	2.47	4.71 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	1.05	1.71	4.34 ± 11.8% (k=2)

[c] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1383 February 24, 2005

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ET3-1383_Feb05 Page 9 of 9

Schmid & Partner Engineering AG

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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

Type:	**ET3DV6**
Serial Number:	**1383**
Place of Assessment:	**Zurich**
Date of Assessment:	**March 31, 2005**
Probe Calibration Date:	**February 24, 2005**

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:

Schmid & Partner Engineering AG

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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 ET3DV6 SN:1383

Conversion factor (± standard deviation)

380 MHz	*ConvF*	**7.6 ± 9 %**	ε_r = **44.3** σ = **0.87 mho/m** (head tissue)
480 MHz	*ConvF*	**7.3 ± 8 %**	ε_r = **43.3** σ = **0.87 mho/m** (head tissue)
380 MHz	*ConvF*	**7.5 ± 9 %**	ε_r = **58.2** σ = **0.92 mho/m** (body tissue)
480 MHz	*ConvF*	**7.3 ± 8 %**	ε_r = **56.7** σ = **0.94 mho/m** (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

Schmid & Partner Engineering AG

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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

Type:	**ET3DV6**
Serial Number:	**1383**
Place of Assessment:	**Zurich**
Date of Assessment:	**February 28, 2005**
Probe Calibration Date:	**February 24, 2005**

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:

Schmid & Partner Engineering AG

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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 ET3DV6 SN:1383

Conversion factor (± standard deviation)

150 MHz	*ConvF*	**8.6 ± 10%**	ε_r = **52.3** σ = **0.76 mho/m** (head tissue)
236 MHz	*ConvF*	**7.9 ± 10%**	ε_r = **48.2** σ = **0.82 mho/m** (head tissue)
784 MHz	*ConvF*	**6.6 ± 7%**	ε_r = **41.8** σ = **0.90 mho/m** (head tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

Schmid & Partner Engineering AG

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Dosimetric E-Field Probe ET3DV6 SN:1383

Conversion factor (± standard deviation)

150 MHz	*ConvF*	**8.2 ± 10%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
236 MHz	*ConvF*	**7.9 ± 10%**	**ε_r = 59.8** **σ = 0.87 mho/m** (body tissue)
300 MHz	*ConvF*	**7.8 ± 9%**	**ε_r = 58.2** **σ = 0.92 mho/m** (body tissue)
350 MHz	*ConvF*	**7.6 ± 9%**	**ε_r = 57.7** **σ = 0.93 mho/m** (body tissue)
784 MHz	*ConvF*	**6.3 ± 7%**	**ε_r = 55.4** **σ = 0.97 mho/m** (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

Appendix C
Dipole Certificates

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

Client Motorola CGISS

CALIBRATION CERTIFICATE

Object(s)	D450V2 - SN:1002
Calibration procedure(s)	QA CAL-15.v2 Calibration procedure for dipole validation kits below 800 MHz
Calibration date:	March 13, 2004
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 (SPEAG, in house check Oct-03)	In house check: Oct 05
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 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Fin Bomholt	R&D Director	

Date issued: March 13, 2004

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.

D450V2- SN:1002

1. Measurement Conditions

The measurements were performed in the 6mm thick flat phantom filled with **head** simulating liquid of the following electrical parameters at 450 MHz:

Relative Dielectricity	**45.1**	± 5%
Conductivity	**0.85 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.45 at 450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center of the flat phantom and the dipole was oriented parallel to the longer side of the phantom. The standard measuring distance was 15mm from dipole center to the liquid surface including the 6mm thick phantom shell. The included distance spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was 398 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**5.33 mW/g** ± 20.7 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**3.55 mW/g** ± 20.2 % (k=2)[1]

D450V2- SN:1002

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.351 ns**	(one direction)
Transmission factor:	**0.993**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance spacer was in place during impedance measurements.

Feedpoint impedance at 450 MHz:	Re{Z} = **54.0 Ω**
	Im {Z} = **-8.5 Ω**
Return Loss at 450 MHz	**-21.1 dB**

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

6. Power Test

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 03/13/04 14:31:46

Test Laboratory: SPEAG, Zurich, Switzerland
DUT: Dipole 450 MHz; Serial: D450V2 - SN:1002

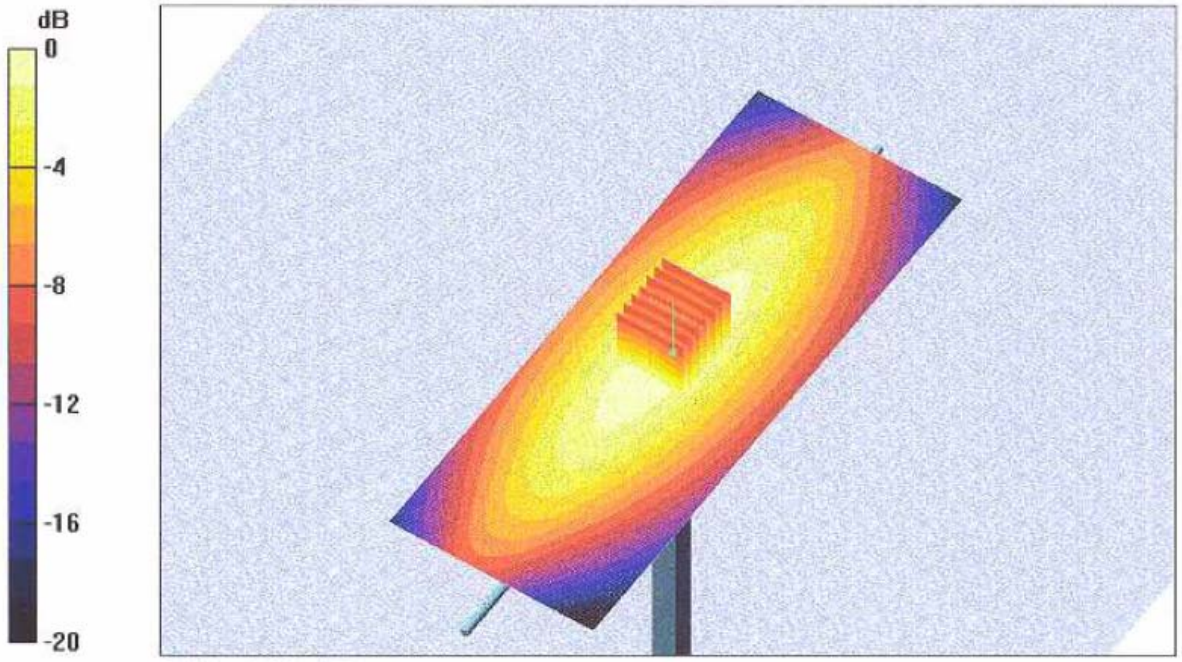
Communication System: CW;Duty Cycle: 1:1;Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.85 mho/m; ε_r = 45.1; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.45, 6.45, 6.45); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Phantom: Flat Phantom 4.4; Phantom section: Flat Section
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=15mm, Pin=398mW/Area Scan (61x161x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 53 V/m; Power Drift = -0.0 dB
Maximum value of SAR (interpolated) = 2.25 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 2.28 mW/g
Peak SAR (extrapolated) = 3.24 W/kg
SAR(1 g) = 2.12 mW/g; SAR(10 g) = 1.41 mW/g



0 dB = 2.28mW/g

Date/Time: 03/13/04 14:31:46

Test Laboratory: SPEAG, Zurich, Switzerland
DUT: Dipole 450 MHz; Serial: D450V2 - SN:1002

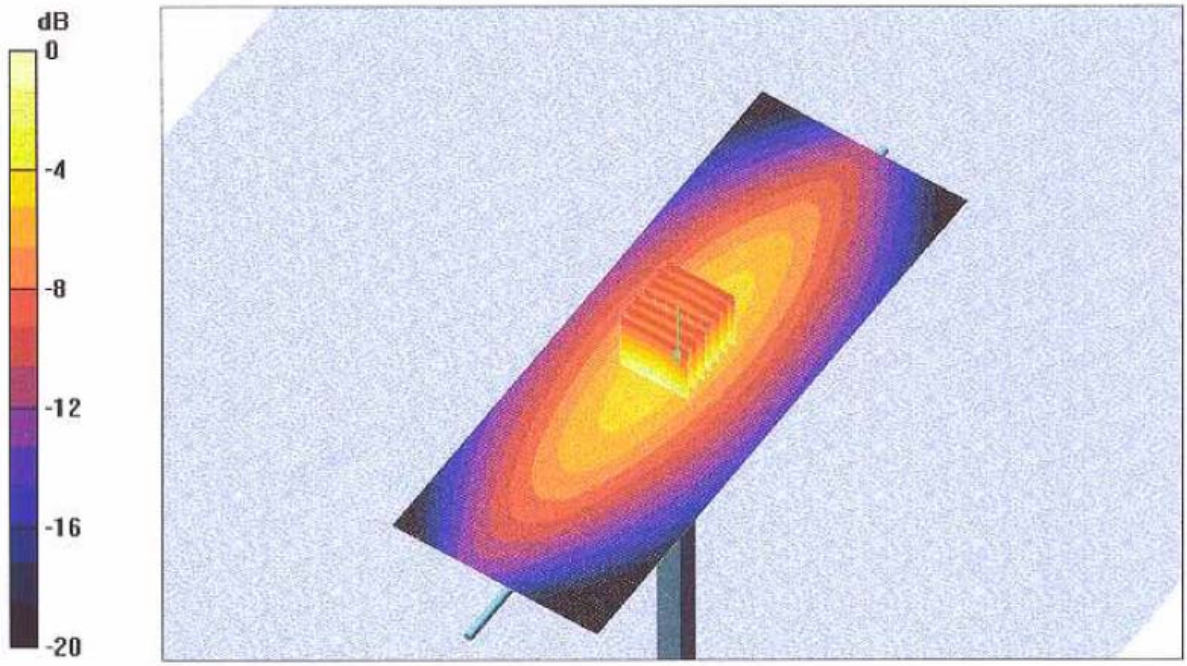
Communication System: CW;Duty Cycle: 1:1;Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.85 mho/m; ε_r = 45.1; ρ = 1000 kg/m^3

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.45, 6.45, 6.45); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Phantom: Flat Phantom 4.4; Phantom section: Flat Section
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=15mm, Pin=398mW/Area Scan (61x161x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 53 V/m; Power Drift = -0.0 dB
Maximum value of SAR (interpolated) = 2.25 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 5.72 mW/g
Peak SAR (extrapolated) = 8.13 W/kg
SAR(1 g) = 5.33 mW/g; SAR(10 g) = 3.55 mW/g
Normalized to target power = 1 W and actual power = 0.398 W



0 dB = 5.72mW/g

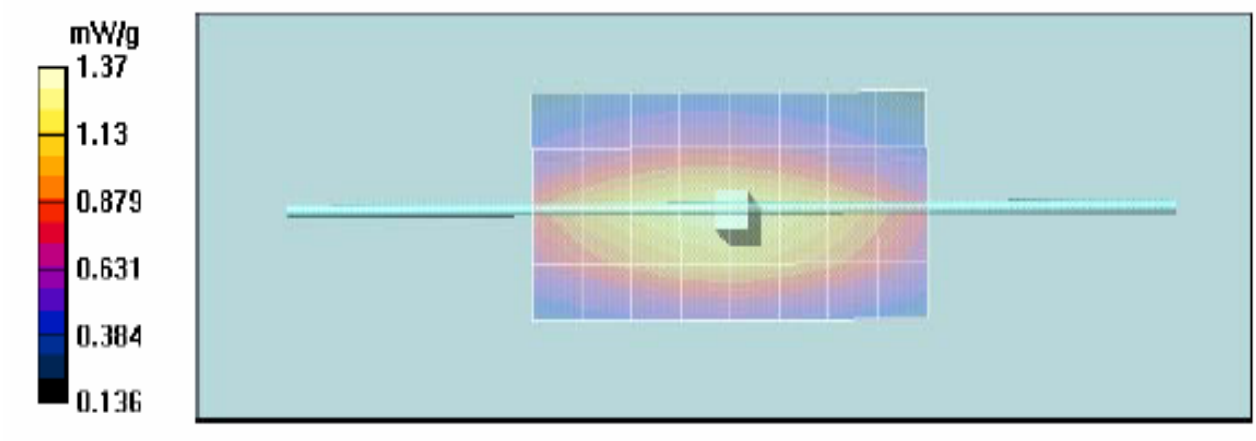
Appendix D
Test System Verification Scans

Note: Dipole validation scans at the head from SPEAG are provided in APPENDIX D. The GEMS EME lab validated the dipole to the applicable IEEE system performance targets. Within the same day system validation was performed using FCC body tissue parameters to generate the system performance target values for body at the applicable frequency. The results of the GEMS EME system performance validation are provided herein. To assess the isotropic characteristics of the measurement probe, two system performance zoom scans (0 and 90 degrees) were measured. The results were averaged together and adjusted to account for the power drift in order to obtain the final calculated 1 and 10 gram results.

Motorola GEMS EME Lab
SPEAG 450 MHz Dipole; Model D450V2, SN 1002; Test Date: 7/19/05
Run #: JsT-SYSP-450H-050719-01
Sim.Tissue Temp: 21.1 (C)
Model #: D450V2 S/N: 1002
TX Freq: 450 (MHz) Start power: 250 (mW)

Target:
5.13 mW/g for 1g SAR 3.32 mW/g for 10g SAR
5.17 mW/g calculated 1g-SAR; + 0.74% from target (including drift)
3.31 mW/g calculated 10g-SAR; - 0.16% from target (including drift)

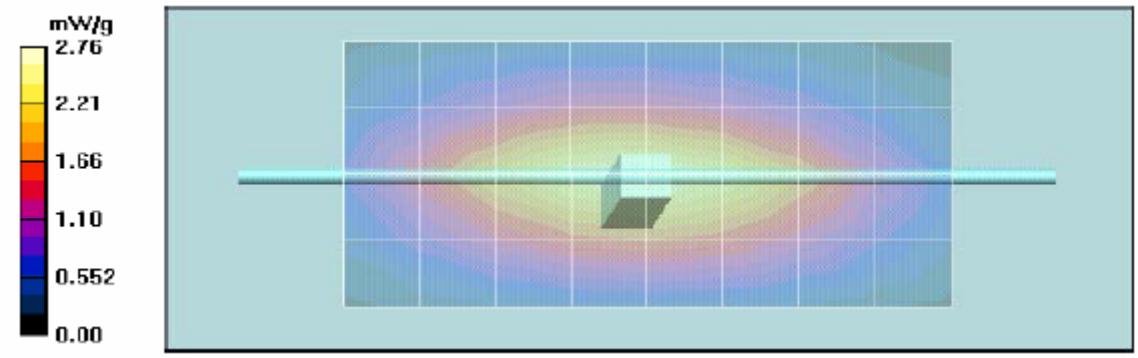
Probe: ET3DV6 - SN1383, Calibrated: 2.24/2005, ConvF(7.3, 7.3, 7.3),
Duty Cycle: 1:1, Medium: 450 MHz IEEE Head, Medium parameters used: σ = 0.87 mho/m, ε_r = 43.6; ρ = 1000 kg/m^3 ;
Electronics: DAE3 Sn406, Calibrated: 11/17/2004
System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 39.2 V/m; Power Drift = 0.0435 dB; Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 1.31 mW/g; SAR(10 g) = 0.840 mW/g
System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 39.2 V/m; Power Drift = 0.0435 dB; Peak SAR (extrapolated) = 2.29 W/kg
SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.834 mW/g



Motorola GEMS EME Lab
SPEAG 450 MHz Dipole; Model D450V2, SN 1002; Test Date: 7/20/05
Run #: CM-SYSP-450H-050720-01
Sim.Tissue Temp: 21.7 (C)
Model #: D450V2 S/N: 1002
TX Freq: 450 (MHz) Start power: 250 (mW)

Target:
5.13 mW/g for 1g SAR 3.32 mW/g for 10g SAR
5.16 mW/g calculated 1g-SAR; + 0.57% from target (including drift)
3.33 mW/g calculated 10g-SAR; + 0.20% from target (including drift)

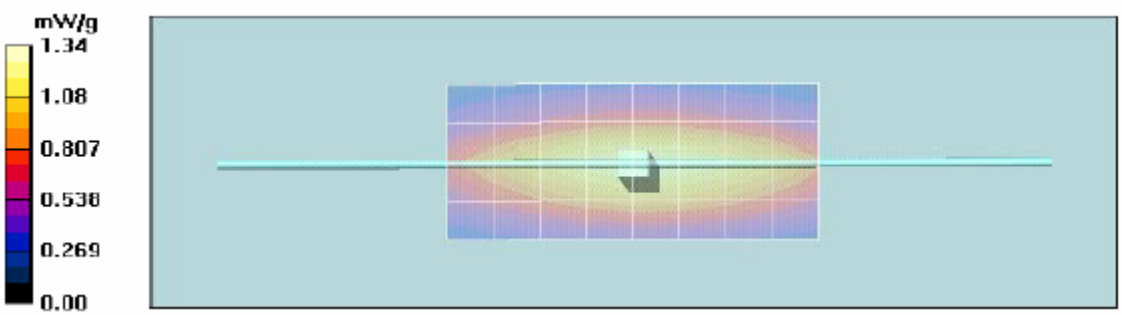
Probe: ET3DV6 - SN1383, Calibrated: 2.24/2005, ConvF(7.3, 7.3, 7.3),
Duty Cycle: 1:1, Medium: 450 MHz IEEE Head, Medium parameters used: σ = 0.88 mho/m, ε_r = 44.2; ρ = 1000 kg/m^3 ;
Electronics: DAE3 Sn406, Calibrated: 11/17/2004
System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 39.6 V/m; Power Drift = 0.017 dB; Peak SAR (extrapolated) = 2.29 W/kg
SAR(1 g) = 1.31 mW/g; SAR(10 g) = 0.842 mW/g
System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 39.6 V/m; Power Drift = 0.017 dB; Peak SAR (extrapolated) = 2.23 W/kg
SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.828 mW/g



Motorola GEMS EME Lab
SPEAG 450 MHz Dipole; Model D450V2, SN 1002; Test Date: 7/21/05
Run #: JsT-SYSP-450B-050721-01
Sim.Tissue Temp: 22.1 (C)
TX Freq: 450 (MHz) Start power: 250 (mW)

Target:
5.26 mW/g for 1g SAR 3.41 mW/g for 10g SAR
5.15 mW/g calculated 1g-SAR; - 2.17% from target (including drift)
3.32 mW/g calculated 10g-SAR; - 2.50% from target (including drift)

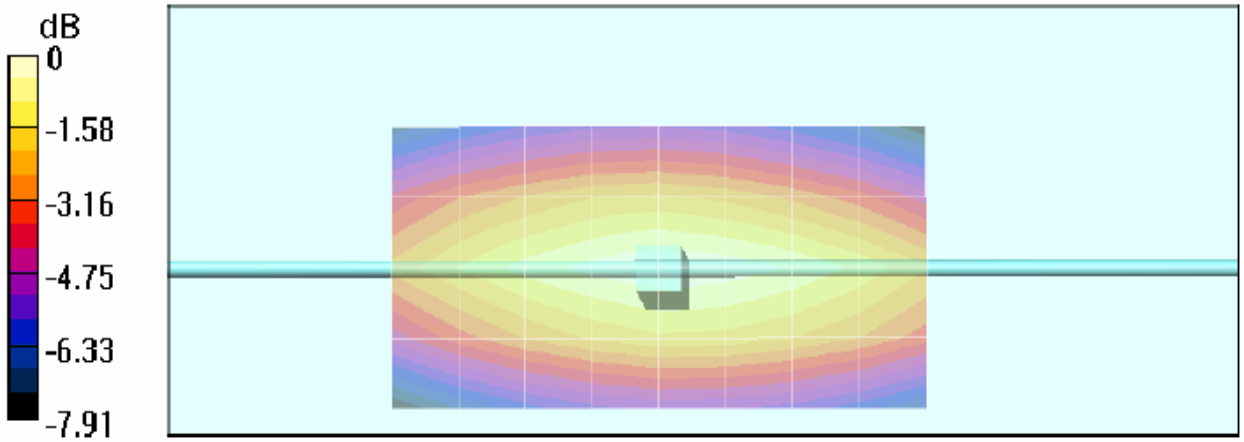
Probe: ET3DV6 - SN1383, Calibrated: 2/24/2005, ConvF(7.3, 7.3, 7.3),
Duty Cycle: 1:1, Medium: 450 MHz FCC Body, Medium parameters used: σ = 0.93 mho/m, ε_r = 55.6; ρ = 1000 kg/m^3 ;
Electronics: DAE3 Sn406, Calibrated: 11/17/2004
System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 38.1 V/m; Power Drift = -0.0221 dB; Peak SAR (extrapolated) = 2.26 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.830 mW/g
System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 38.1 V/m; Power Drift = -0.0221 dB; Peak SAR (extrapolated) = 2.22 W/kg
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.823 mW/g



Motorola GEMS EME Lab
SPEAG 450 MHz Dipole; Model D450V2, SN 1002; Test Date: 7/27/05
Run #: CM-SYSP-450H-050727-10
Sim.Tissue Temp: 21.2 (C)
TX Freq: 450 (MHz) Start power: 250 (mW)

Target:
5.13 mW/g for 1g SAR 3.32 mW/g for 10g SAR
5.04 mW/g calculated 1g-SAR;-1.83% from target (including drift)
3.26 mW/g calculated 10g-SAR; -1.89% from target (including drift)

Probe: ET3DV6 - SN1383, Calibrated: 2/24/2005, ConvF(7.3, 7.3, 7.3),
Duty Cycle: 1:1, Medium: 450 MHz IEEE Head, Medium parameters used: σ = 0.85 mho/m, ε_r = 43.6; ρ = 1000 kg/m^3 ;
Electronics: DAE3 Sn406, Calibrated: 11/17/2004
System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 39.6 V/m; Power Drift = 0.003 dB; Peak SAR (extrapolated) = 2.21 W/kg
SAR(1 g) = 1.26 mW/g; SAR(10 g) = 0.817 mW/g
System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 39.6 V/m; Power Drift = 0.003 dB; Peak SAR (extrapolated) = 1.33 W/kg
SAR(1 g) = 1.26 mW/g; SAR(10 g) = 0.812 mW/g



SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	4/1/2005	Frequency (MHz):	450
Lab Location:	CGISS	Mixture Type:	FCC Body
Robot System:	CGISS-3	Ambient Temp.(°C):	21.7
Probe Serial #:	1545	Tissue Temp.(°C):	21.3
DAE Serial #:	401		

Tissue Characteristics

Permitivity:	55.4	Phantom Type/SN:	80302002B-S8
Conductivity:	0.93	Distance (mm):	15

Reference Source:	Dipole	(Dipole/Handset)
Reference SN:	1002	

Power to Dipole: 250 mW

Measured SAR Value:	1.305 mW/g,	0.846 mW/g (10g avg.)
Power Drift:	-0.036600 dB	

New Target/Measured
SAR Value: 5.26 mW/g, 3.41 mW/g (10g avg.)
(normalized to 1.0 W, including drift)

Test performed by: E. Church Initial: E. C

Sys. Per. Chk. Form: 021024

DUT: Dipole 450 MHz

Run #: 050401-01 Test operator: E. Church
Robot = GEMS-3 Phantom #: 80302002B-S8 Sim.Tissue Temp: 21.3 (C)
Model #: D450V2 S/N: 1002
TX Freq: 450 (MHz) Start power: 250 (mW)
Target:
5.26 mW/g for 1g SAR 3.41 mW/g for 10g SAR
5.26 mW/g calculated 1g-SAR; 0 % from target (including drift)
3.41 mW/g calculated 10g-SAR; 0 % from target (including drift)

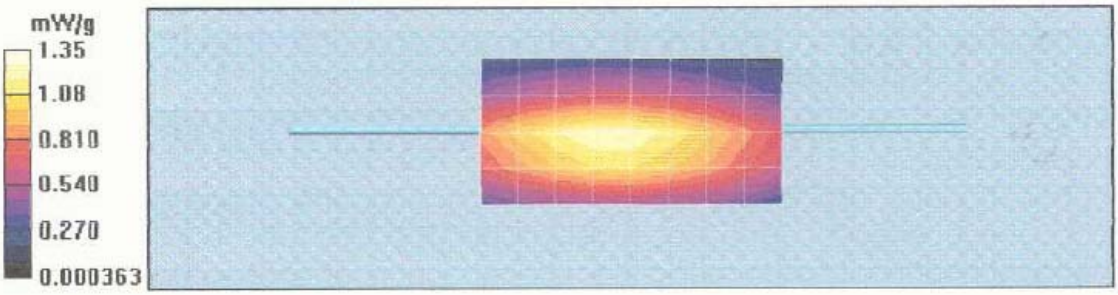
Probe: ET3DV6 - SN1545, Calibrated: 9/1/2004, ConvF(6.6, 6.6, 6.6),
Duty Cycle: 1:1, Medium: 450 MHz Body, Medium parameters used: $\sigma = 0.93$; mho/m, $\varepsilon_r = 55.4$; $\rho = 1000$ kg/m^3 ;
Electronics: DAE3 Sn401, Calibrated: 8/25/2004

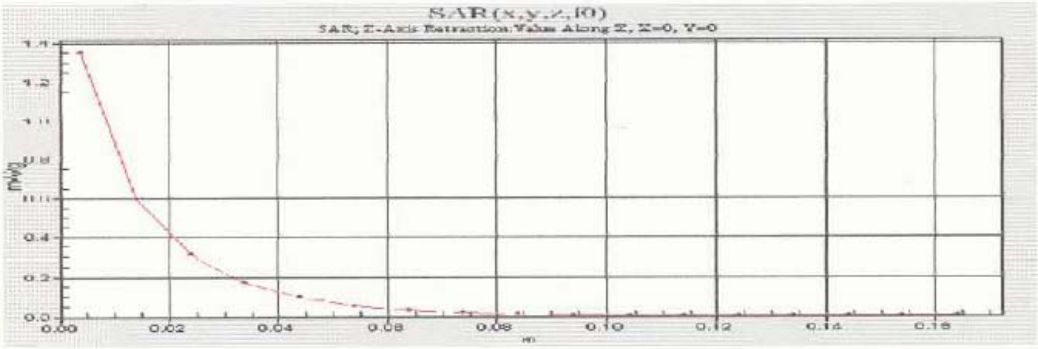
System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 37 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 2.25 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.834 mW/g
Maximum value of SAR (measured) = 1.37 mW/g

System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 37 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 2.29 W/kg
SAR(1 g) = 1.32 mW/g; SAR(10 g) = 0.857 mW/g
Maximum value of SAR (measured) = 1.41 mW/g

System Performance Check/Dipole Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.27 mW/g

System Performance Check/Z-Axis Retraction (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm
Maximum value of SAR (measured) = 1.35 mW/g



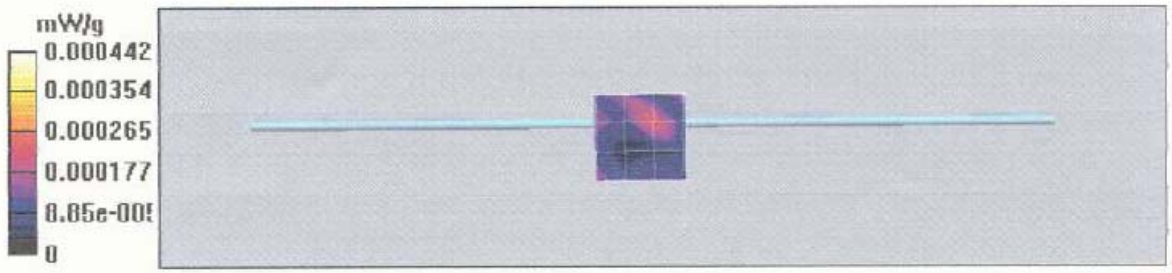


DUT: Dipole 450 MHz

Run #: 050401-01 Test operator: E. Church
Robot = GEMS-3 Phantom #: 80302002B-S8 Sim.Tissue Temp: 21.3 (C)
Model #: D450V2 S/N: 1002
TX Freq: 450 (MHz) Start power: 250 (mW)
Target:
5.26 mW/g for 1g SAR 3.41 mW/g for 10g SAR
5.26 mW/g calculated 1g-SAR; 0 % from target (including drift)
3.41 mW/g calculated 10g-SAR; 0 % from target (including drift)

Probe: ET3DV6 - SN1545, Calibrated: 9/1/2004, ConvF(6.6, 6.6, 6.6),
Duty Cycle: 1:1, Medium: 450 MHz Body, Medium parameters used: $\sigma = 0.93$; mho/m, $\varepsilon_r = 55.4$; $\rho = 1000$ kg/m^3 ;
Electronics: DAE3 Sn401, Calibrated: 8/25/2004

System Performance Check/Noise Cube (4x4x7)/Cube 0: Measurement grid: dx=10mm, dy=10mm, dz=5mm
Reference Value = 37 V/m; Power Drift = not measured
Maximum value of SAR (measured) = 0.000442 mW/g



SYSTEM VALIDATION

Date:	4/1/2005	Frequency (MHz):	450
Lab Location:	CGISS	Mixture Type:	IEEE Head
Robot System:	CGISS-3	Ambient Temp.(°C):	21.6
Probe Serial #:	1545	Tissue Temp.(°C):	20.7
DAE Serial #:	401		

Tissue Characteristics

Permitivity:	43.4	Phantom Type/SN:	80302002C-S9
Conductivity:	0.83	Distance (mm):	15

Reference Source: Diploe (Dipole/Handset)
Reference SN: 1002

Power to Dipole: 250 mW
Power Output (radio): _____ mW

Target SAR Value: 4.9 mW/g, 3.3 mW/g (10g avg.)
(normalized to 1.0 W)

Measured SAR Value: 1.285 mW/g, 0.831 mW/g (10g avg.)
Power Drift: 0.00484 dB

Measured SAR Value: 5.13 mW/g, 3.32 mW/g (10g avg.)
(normalized to 1.0 W, including drift)

Percent Difference From Target (MUST be within System Uncertainty): 4.78 % (1g ave)
0.62 % (10g ave)

Test performed by: E. Church Initial: E. C

DUT: Dipole 450 MHz

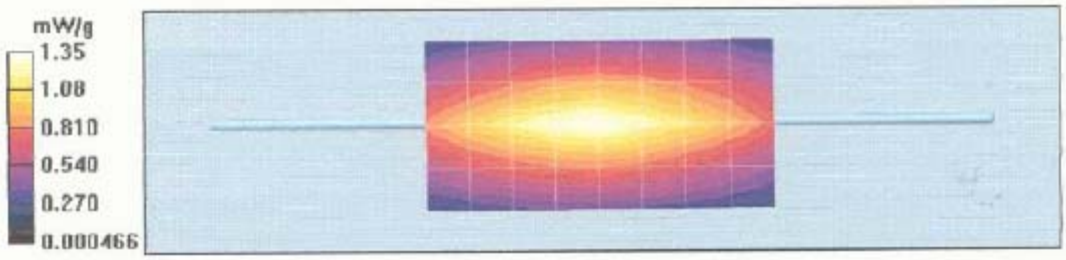
Run #: 050401-02 Test operator: E. Church
Robot = GEMS-3 Phantom #: 80302002C-S9 Sim.Tissue Temp: 20.7 (C)
Model #: D450V2 S/N: 1001
TX Freq: (MHz) 450 Start power: 250 (mW)
Target:
5.13 mW/g for 1g SAR 3.32 mW/g for 10g SAR
5.13 mW/g calculated 1g-SAR; 0 % from target (including drift)
3.32 mW/g calculated 10g-SAR; 0 % from target (including drift)
Probe: ET3DV6 - SN1545, Calibrated: 9/1/2004, ConvF(6.6, 6.6, 6.6),
Duty Cycle: 1:1, Medium: 450 MHz Head, Medium parameters used: $\sigma = 0.83$; mho/m, $\varepsilon_r = 43.4$; $\rho = 1000$ kg/m^3 ;
Electronics: DAE3 Sn401, Calibrated: 8/25/2004

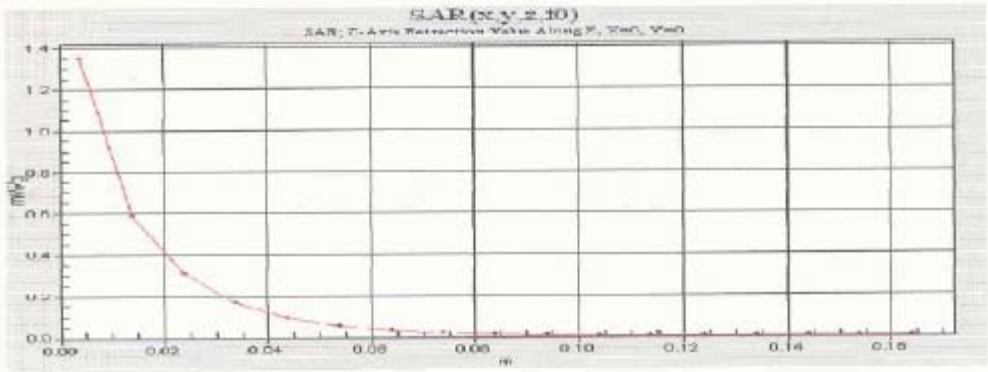
System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 40.2 V/m; Power Drift = 0.00484 dB
Peak SAR (extrapolated) = 2.22 W/kg
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.820 mW/g
Maximum value of SAR (measured) = 1.35 mW/g

System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 40.2 V/m; Power Drift = 0.00484 dB
Peak SAR (extrapolated) = 2.25 W/kg
SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.841 mW/g
Maximum value of SAR (measured) = 1.38 mW/g

System Performance Check/Dipole Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.34 mW/g

System Performance Check/Z-Axis Retraction (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm



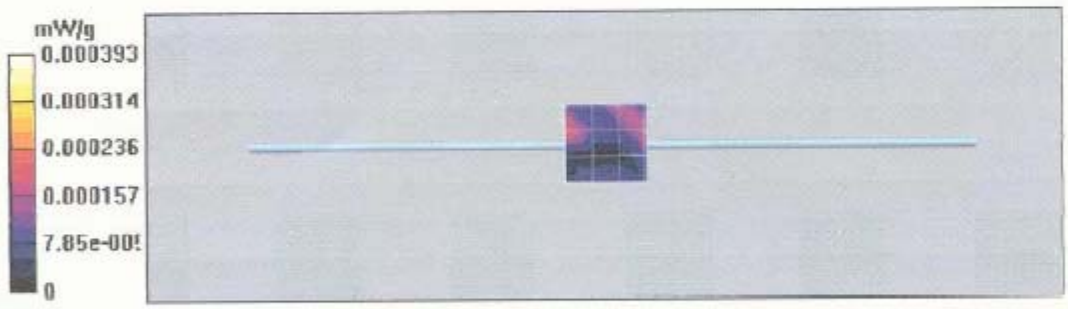


DUT: Dipole 450 MHz

Run #: 050401-02 Test operator: E. Church
Robot = GEMS-3 Phantom #: 80302002C-S9 Sim.Tissue Temp: 20.7 (C)
Model #: D450V2 S/N: 1001
TX Freq: (MHz) 450 Start power: 250 (mW)
Target:
5.13 mW/g for 1g SAR 3.32 mW/g for 10g SAR
5.13 mW/g calculated 1g-SAR; 0 % from target (including drift)
3.32 mW/g calculated 10g-SAR; 0 % from target (including drift)

Probe: ET3DV6 - SN1545, Calibrated: 9/1/2004, ConvF(6.6, 6.6, 6.6),
Duty Cycle: 1:1, Medium: 450 MHz Head, Medium parameters used: $\sigma = 0.83$; mho/m, $\varepsilon_r = 43.4$; $\rho = 1000$ kg/m^3 ;
Electronics: DAE3 Sn401, Calibrated: 8/25/2004

System Performance Check/Zoom Scan (4x4x7)/Cube 0: Measurement grid: dx=10mm, dy=10mm, dz=5mm
Reference Value = 40.2 V/m; Power Drift = not measured
Maximum value of SAR (measured) = 0.000393 mW/g



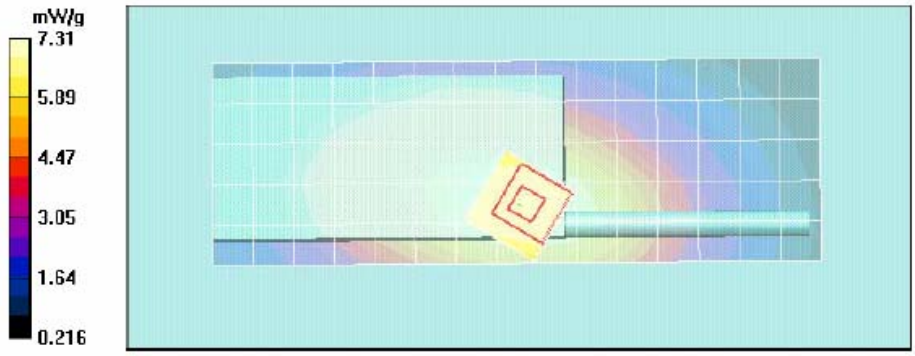
Appendix E
DUT Scans (Shortened scans & Highest SAR configurations)

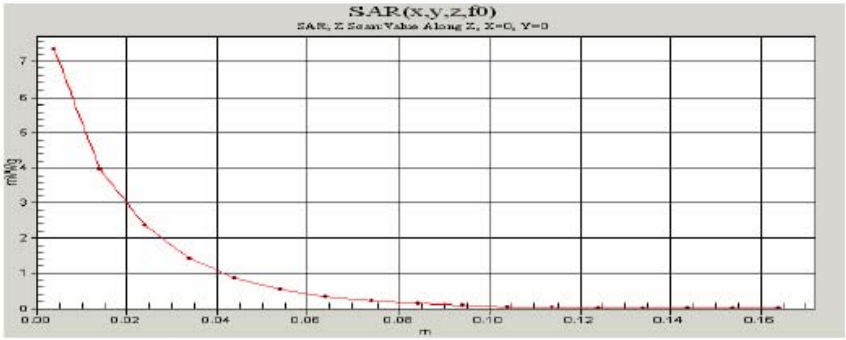
Motorola GEMS EME Laboratory
FCC ID: AZ489FT4826; Test Date: 7/20/2005
Run #: CM-Face-050720-08
Sim. Tissue Temp: 21.7 (C)
Model #: PMUE1407A SN: 749TYQ0146

Antenna: PMAE4003A TX Freq (MHz): 433.025
Battery: NNTN5332A Start power: 4.34 W
Carry acc.: NTN8266B belt clip fixed to battery Audio acc.: None

Comments: **Front of DUT facing phantom at 2.5 cm**
Probe: ET3DV6 - SN1383, Calibrated: 2/24/2005, ConvF(7.3, 7.3, 7.3)
Duty Cycle: 1:1, Medium: 436 IEEE MHz Head , Medium parameters used: σ = 0.87 mho/m, ε_r = 44.4; ρ = 1000 kg/m3
Electronics: DAE3 Sn406, Calibrated: 11/17/2004
Face template/5x5x7 Zoom Scan/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=7.55mm
Reference Value = 95.9 V/m; Power Drift = -0.547 dB
SAR(1 g) = 7.36 mW/g; SAR(10 g) = 5.36 mW/g

Comments: Short Scan at the face with front of unit 2.5 cm.
Shortened scan reflects highest S.A.R. producing configuration; Run time 6 minutes.
Representative "normal" scan run time was 23 minutes
"Shortened" scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 5.77mW/g; 10-g Avg. = 4.20mW/g
"Normal" scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 5.56mW/g; 10-g Avg. = 4.00mW/g
(See part 1 of 1 section 9.0 run #CM-Face-050719-04)

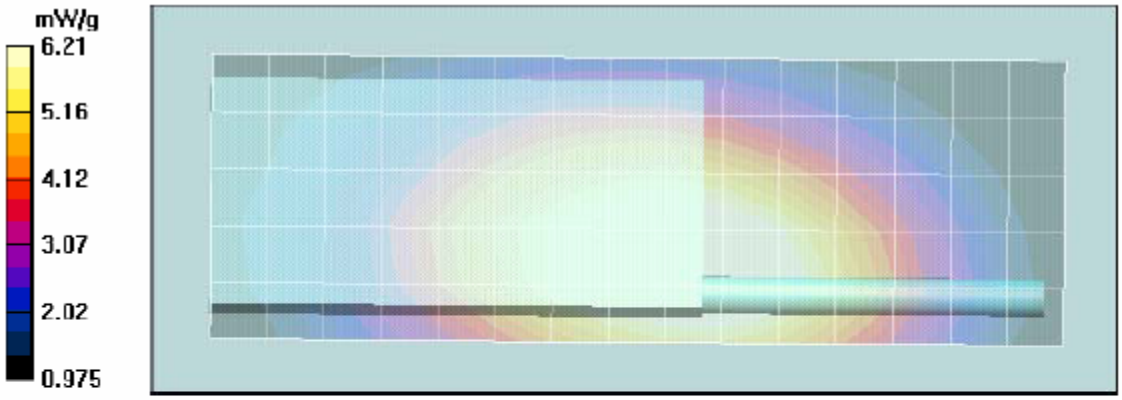


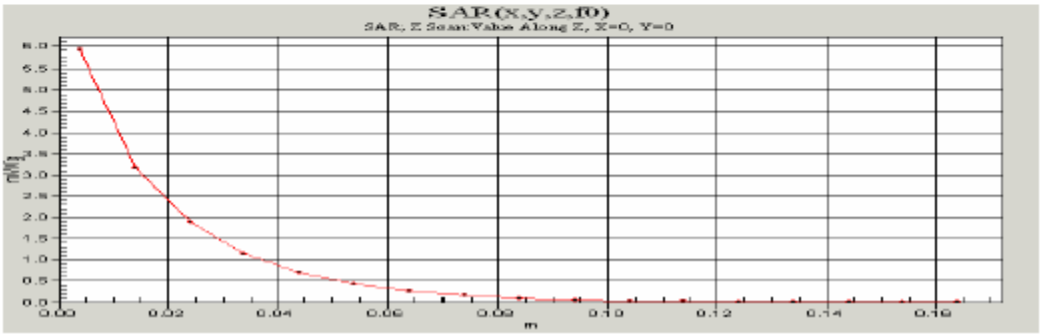


Motorola GEMS EME Laboratory
FCC ID: AZ489FT4826; Test Date: 7/19/05
Run #: CM-Face-050719-04
Sim. Tissue Temp: 21.7 (C)
Model #: PMUE1407A SN: 749TYQ0146

Antenna: PMAE4003A TX Freq (MHz): 433.025
Battery: NNTN5332A Start power: 4.17 W
Carry acc.: NTN8266B belt clip fixed to battery Audio acc.: None

Comments: **Front of DUT facing phantom at 2.5 cm**
Probe: ET3DV6 - SN1383, Calibrated: 2/24/2005, ConvF(7.3, 7.3, 7.3)
Duty Cycle: 1:1, Medium: 436 IEEE MHz Head, Medium parameters used: σ = 0.86 mho/m, ε_r = 43.9; ρ = 1000 kg/m3
Electronics: DAE3 Sn406, Calibrated: 11/17/2004
Face template/7x7x7 Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.1 V/m; Power Drift = -1.12 dB; Peak SAR (extrapolated) = 9.19 W/kg
SAR(1 g) = 5.97 mW/g; SAR(10 g) = 4.3 mW/g

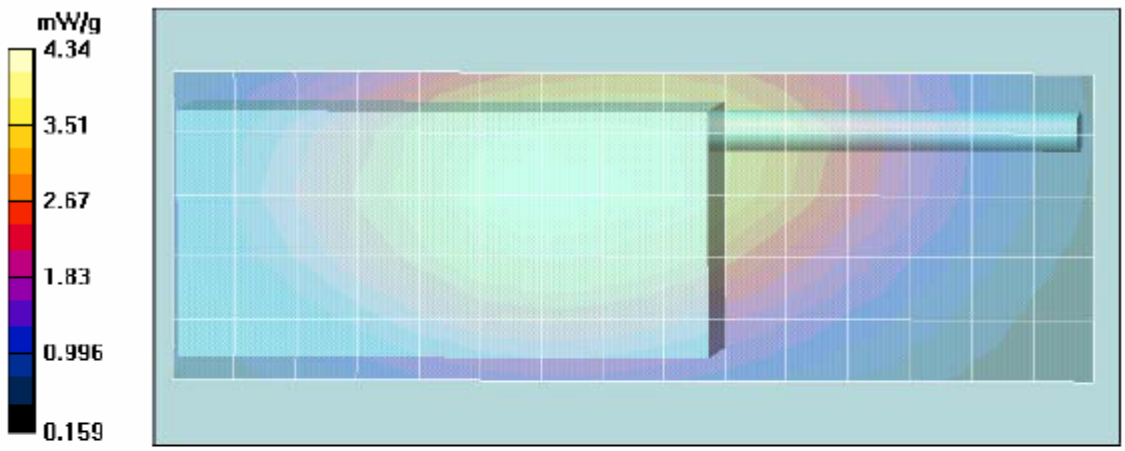


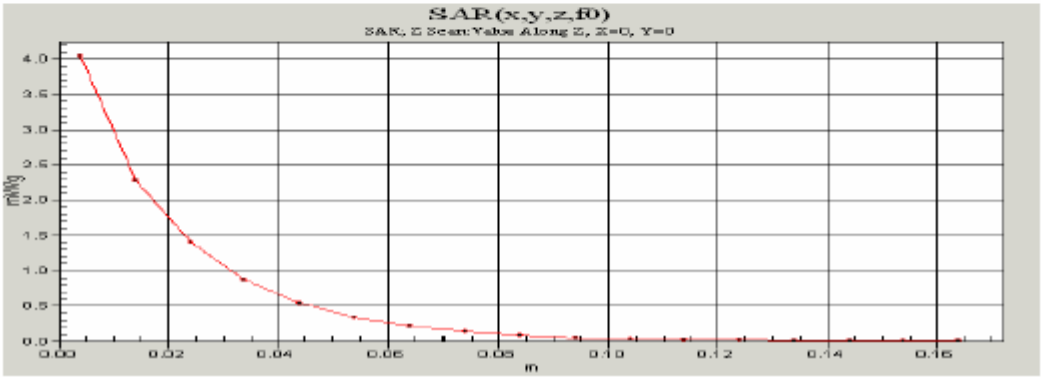


Motorola GEMS EME Laboratory
FCC ID: AZ489FT4826; Test Date: 7/21/05
Run #: CM-Ab-050721.10
Sim. Tissue Temp: 21.6 (C)
Model #: PMUE1407A SN: 749TYQ0146

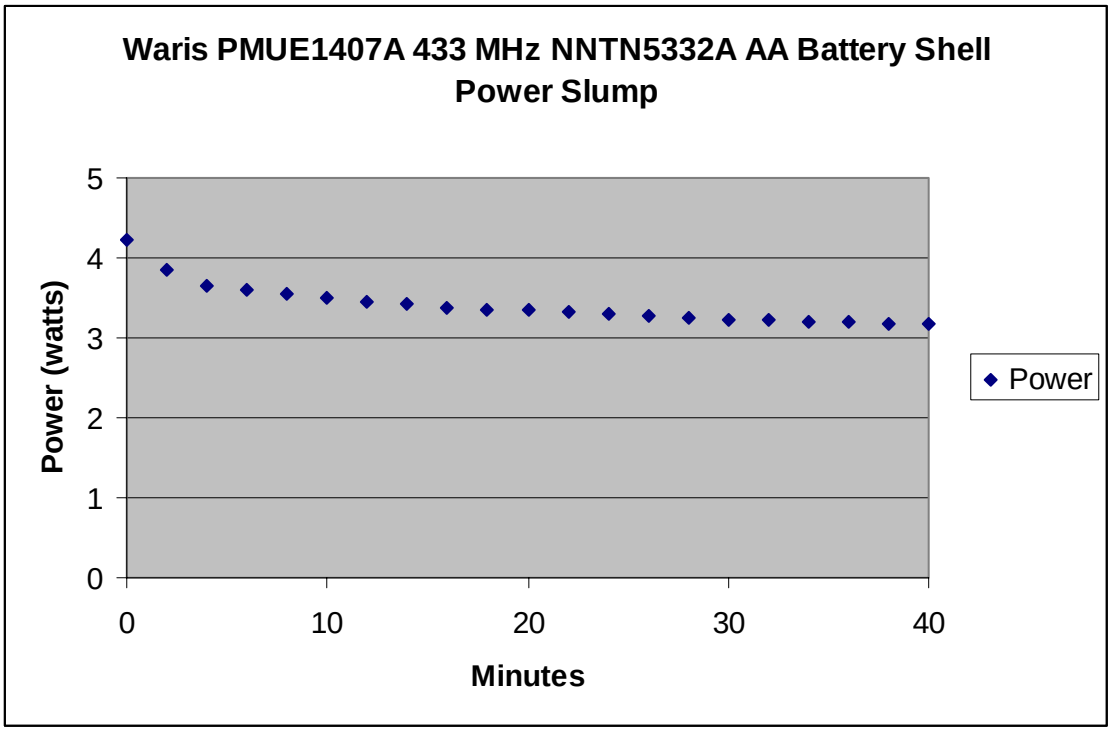
Antenna: PMAE4003A TX Freq (MHz): 433.025
Battery: NNTN5332A Start power: 4.35 W
Carry acc.:NTN8266B belt clip fixed to battery Audio acc.: HMN9052E

Comments: **DUT back against phantom**
Probe: ET3DV6 - SN1383, Calibrated: 2/24/2005, ConvF(7.3, 7.3, 7.3)
Duty Cycle: 1:1, Medium: 436 MHz FCC Body, Medium parameters used: σ = 0.92 mho/m, ε_r = 55.9; ρ = 1000 kg/m3
Electronics: DAE3 Sn406, Calibrated: 11/17/2004
Body template/7x7x7 Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 70.3 V/m; Power Drift = -0.898 dB; Peak SAR (extrapolated) = 6.36 W/kg
SAR(1 g) = 4.26 mW/g; SAR(10 g) = 3.15 mW/g





APPENDIX F
DUT Supplementary Data (Power slump)



Minutes	Power
0	4.22
2	3.84
4	3.66
6	3.61
8	3.55
10	3.50
12	3.45
14	3.42
16	3.38
18	3.36
20	3.34
22	3.32
24	3.30
26	3.28
28	3.25
30	3.23
32	3.22
34	3.21
36	3.19
38	3.18
40	3.17

Appendix G
DUT Test Position Photos

Figure 1: Highest S.A.R. Test Position (Face)
Front of radio separated 2.5cm

Figure 2: Highest S.A.R. Test Position (Body)
Unit back against phantom
Audio accessory model HMN9052E attached.