

 MOTOROLA	 Certificate Number: 1449-01
FCC ID: AZ489FT4872 DECLARATION OF COMPLIANCE SAR ASSESSMENT	
Networks & Enterprise EME Test Laboratory 8000 West Sunrise Blvd Fort Lauderdale, FL. 33322	Date of Report: 4/7/06 Report Revision: Rev O Report ID: FCC rpt_Alpha L UHF R1_060407_SR3785
Responsible Engineer: Michael Sailsman (Sr. Staff Eng.) Date/s Tested: 3/22/06-3/27/06 Manufacturer/Location: Motorola – Penang Sector/Group/Div.: NE/GTDG Date submitted for test: 3/15/06 DUT Description: Alpha L 4W 12.5/25K-16CH NA Test TX mode(s): CW Max. Power output: 4.5W Nominal Power: 4.0W Tx Frequency Bands: 403-425MHz Signaling type: FM Model(s) Tested: PMUE2736A/AAH84QCJ8AA1AN Model(s) Certified: PMUE2736A/AAH84QCJ8AA1AN Serial Number(s): 0277GD1253, 0277GD1256 Classification: Occupational/Controlled Rule Part(s): 90 Approved Accessories: Antenna(s): PMAE4019A (403-425MHz ¼ wave, -3dBi); PMAE4019AR (403-425MHz ¼ wave, -3dBi) Battery(ies): PMNN4071ARC (Mag One NiMH, 1200mAh: CHN-LBL, Boxed); PMNN4071A (Mag One NiMH, 1200mAh), PMNN4071AR (Mag One NiMH, 1200mAh: Boxed); PMNN4071AC (MAG One NiMH, 1200mAh: CHN-LBL) Body worn accessory(ies): PMLN4743A (Spring belt); PMLN4691A (Standard belt clip); PMLN4741A (soft leather carry case); PMLN4742A (hard leather carry case) Audio/Data cable accessory(ies): PMMN4008A (Remote speaker microphone); PMLN4442A (Earbud w/ in-line mic and PTT/VOX switch); PMLN4443A (Ear receiver w/ in-line mic and PTT/VOX switch); PMLN4444A (Earphone Boom mic w/ in-line mic and PTT/VOX); PMLN4445A (Ultra lightweight headset w/ in-line PTT/VOX switch); PMLN4294C (Earbud w/ combined microphone and PTT); PMLN4606A (2-wire surveillance kit w/ clear acoustic tube); PMLN4605A (Clear Acoustic kit); PMLN4658A (D-shell earset w/ boom mic & PTT/VOX switch) Max. Calc. 1-g/10-g Avg. SAR: 6.00/4.16 W/kg (Body) Max. Calc. 1-g/10-g Avg. SAR: 3.84/2.76 W/kg (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.	
Deanna Zakharia's signature on file Ken Enger GEMS EME Lab Senior Resource Manager, Laboratory Director, Approval Date: 4/7/06	Certification Date: 4/7/06 Certification No.: L1060431

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Report REVISION HISTORY

Date	Revision	Comments
4/7/06	O	Pilot release

1.0 Introduction and Overview

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (SAR) measurements performed at the GEMS EME Test Lab for the model number PMUE2736A/AAH84QCJ8AA1AN of FCC ID: AZ489FT4872. The results herein reflect final pilot results.

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

2.0 Referenced 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 - ANSI - (averaged over the whole body)	0.08	0.4
Spatial Peak - ANSI - (averaged over any 1-g of tissue)	1.60	8.0
Spatial Peak – ICNIRP/ANSI - (hands/wrists/feet/ankles averaged over 10-g)	4.0	20.0
Localized SAR - ICNIRP - (Head and Trunk 10-g)	2.0	10.0

3.0 Description of Device Under Test (DUT)

FCC ID: AZ489FT4872 is a UHF portable two-way radio that operates using frequency modulation (FM) incorporating traditional simplex transmission protocol. This radio is intended to be assessed using CW transmission via its' inherent test mode signaling capability. The radio has a removable antenna and does not have a keypad or a display and is capable of transmitting in the 403-425MHz band.

The nominal output power is 4.0 watts with a maximum output power of 4.5 watts as defined by the upper limit of the production line final test station. The intended operating positions are “at the face” with the DUT at least 1 inch from the mouth, and “at the body” by means of the offered body-worn accessories. Body-worn audio and PTT operation is accomplished by means of optional remote accessories that connect to the radio.

This device will be marketed to and used by employees solely for occupational operations, such as public safety agencies, e.g. police, fire and emergency medical. User training is the responsibility of these agencies, which can be 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 and wireless data devices.

FCC ID: AZ489FT4872 is offered with the options and accessories listed on the coversheet of this report:

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™) SAR measurement system Version 4.6 build 23 manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The test system consists of a Stäubli RX90L robot, DAE3V1, and ET3DV6 E-Field probes. Please reference the SPEAG user manual and application notes for detailed probe, robot, and SAR 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 SAR 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 sugar based simulate 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. For Diacetin and Glycol based simulates, sugar and HEC ingredients are not needed. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

Simulated Tissue Composition

% of listed ingredients	450	
	Head	Body
Sugar	56.0	46.5
DGBE (Glycol)	NA	NA
Diacetin	NA	NA
De ionized -Water	39.1	50.53
Salt	3.8	1.87
HEC	1.0	1.0
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 (HP)	E4419B	MY40330364	1/31/2007
Power Sensor (HP)	8482B	3318A07392	11/30/2006
Power Sensor (HP)	8482H	1926AO1906	12/12/2006
Bi-Directional Coupler (NARDA)	3020A	40295	7/18/2006
Signal Generator (HP)	E4421B	US39270649	2/28/2007
AMP (Amplifier Research)	1W1000	16625	CNR
Tissue Station			
Network Analyzer (HP)	8753D	3410A09135	2/22/2007
Dielectric Probe Kit (HP)	85070C	US99360076	CNR
Dipole			
Speag Dipole	D450V2	1001	5/22/2006

6.0 SAR Measurement System Verification

The SAR measurements were conducted with probe model/serial number ET3DV6/SN1384. The system performance check was conducted daily and within 24 hours prior to testing. DASY output files of the probe/dipole calibration certificates and system performance test results are included in appendices B, C, 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 SAR measurements is measured daily and within 24 hours prior to actual SAR 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.

Actual versus Target tissue parameters (3/22/06-3/27/06)

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	57.6-58.1	0.94	0.93-0.95
414	57.1	58.1-58.4	0.94	0.90-0.92

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	44.5-44.5	0.87	0.87-0.87
414	43.9	45.4-45.9	0.87	0.84-0.85

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)
1384	FCC Body	4/28/04	SPEAG D450V2 /1001	4.82 +/- 0.000	4.96 +/- 10%	3/27/06
1384	IEEE Head	4/28/04	SPEAG D450V2 /1001	5.125 +/- 0.055	4.76 +/- 10%	3/22/06-3/24/06 (3 test days)

Note: See APPENDIX D for an explanation of the reference SAR 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 SAR compliance was calibrated according to 17025 A2LA guidelines.

7.0 DUT Test Strategy and Methodology

7.1 DUT Configuration(s)

The DUT is a portable device with FM transmission signaling operational at the body, and face using the offered accessories. The device is placed in the test positions presented in Appendix G.

Test Plan

All options and accessories listed on the cover page of this report were considered in order to develop the SAR test plan for this product. SAR measurements were performed using a flat phantom with the applicable simulated tissue to assess performance at the body, and face respectively using the relevant transmission mode(s).

Note that a coarse-to-cube approximation methodology was utilized to determine the worst-case SAR performance configuration for each applicable body location. The test configurations that produced the highest SAR 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 [\[Page 11 of 48; Table 1\]](#)

- Assessment of the offered body-worn accessories using the offered battery and antenna.
- Assessment of the offered audio accessories using the worst case configuration from above.
- Assessment of band edges using the worst case configuration from above.
- Assessment using the worst case test configuration at the body overall from above with the back, front, and antenna (back towards phantom) of the DUT separated 2.5cm from the phantom.

Assessments at the Face [\[Page 12 of 48; Table 2\]](#)

- Assessment across the band using the offered antenna and battery.

Shortened scan assessment at the Body [\[APPENDIX E Part 3 of 3\]](#)

- A “shortened” scan was performed using the offered battery and test configuration that produced the highest SAR results overall. 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, a cube scan only was performed. 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 in normal use configuration against the phantom with the offered body worn accessory.

The DUT was positioned with its' front, back, and antenna (back towards phantom) separated 2.5cm from the phantom.

7.2.2 Head

NA

7.2.3 Face

The DUT was positioned with its' front side separated 2.5cm from the phantom.

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 $\pm 2^{\circ}\text{C}$ of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was $15\text{cm} \pm 0.5\text{cm}$. 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 SAR tests reported herein:

	Target	Measured
Ambient Temperature	20 - 25 $^{\circ}\text{C}$	Range: 21.8-22.7 $^{\circ}\text{C}$ Avg. 22.3 $^{\circ}\text{C}$
Relative Humidity	30 - 70 %	Range: 32.9-52.7% Avg. 45.3%
Tissue Temperature	NA	Range: 20.2-21.5 $^{\circ}\text{C}$ Avg. 20.71 $^{\circ}\text{C}$

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.

9.0 Test Results Summary

All SAR 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 DASY4TM coarse and 7x7x7 cube methodology, and they are presented as bolded results. The associated SAR plots are provided in APPENDIX E. Appendix E also presents shortened SAR cube scans to assess the validity of the calculated results presented herein. Note: The results of the shortened cube scans presented in Appendix E demonstrate that the scaling methodology used to determine the calculated SAR results presented herein are valid.

Table1

Assessments at the Body												
Run Number/ SN	Antenna	Freq. (MHz)	Battery	Test position	Carry Case	Additional attachments	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)
Assessment of offered Body worn												
JsT-Ab-060322-04/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4743A	PMMN4008A	4.73	-0.498	3.77	2.73	2.11	1.53
JsT-Ab-060323-05/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4691A	PMMN4008A	4.73	-0.451	6.26	4.57	3.47	2.54
JsT-Ab-060323-06/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4742A	PMMN4008A	4.70	-0.522	0.694	0.517	0.39	0.29
JsT-Ab-060323-07/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4741A	PMMN4008A	4.72	-0.545	3.75	2.76	2.13	1.56
Assessment of offered audio accessories												
JsT-Ab-060323-08/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4442A	4.73	-0.441	6.89	5.04	3.81	2.79
JsT-Ab-060323-09/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4444A	4.70	-0.455	8.26	6.05	4.59	3.36
JsT-Ab-060323-10/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4294C	4.69	-0.337	5.55	4.05	3.00	2.19
JsT-Ab-060323-11/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4658A	4.71	-0.487	8.34	6.11	4.66	3.42
JsT-Ab-060323-12/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4606A	4.70	-0.587	8.07	5.92	4.62	3.39
Assessment of band edges												
*JsT-Ab-060323-13/0277GD1253	PMAE4019 A	403.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4658A	4.69	0.192	11.10	8.14	5.55	4.07
JsT-Ab-060323-14/0277GD1253	PMAE4019 A	424.975	PMNN4071 A	Against phantom	PMLN4691A	PMLN4658A	4.67	-0.429	4.98	3.64	2.75	2.01
Assessment at 2.5cm												
JsT-Ab-060324-02/0277GD1253	PMAE4019 A	403.025	PMNN4071 A	Against phantom	Unit back; antenna at 2.5cm	PMLN4658A	4.69	0.0682	7.97	5.85	3.99	2.93
JsT-Ab-060324-03/0277GD1253	PMAE4019 A	403.025	PMNN4071 A	Against phantom	Unit back at 2.5cm	PMLN4658A	4.66	-0.0423	3.31	2.45	1.67	1.24
JsT-Ab-060324-04/0277GD1253	PMAE4019 A	403.025	PMNN4071 A	Against phantom	Unit front at 2.5cm	PMLN4658A	4.67	-0.0795	4.21	3.10	2.14	1.58
*Assessment with the worst case test configuration above using the full DASY 4 coarse and 7x7x7 cube scan measurements.												
JsT-Ab-060324-05/0277GD1253	PMAE4019 A	403.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4658A	4.66	0.397	12.00	8.32	6.00	4.16
JsT-Ab-060324-06/0277GD1253 (Shortened scan)	PMAE4019 A	403.025	PMNN4071 A	Against phantom	PMLN4691A	PMLN4658A	4.67	0.0043	10.70	7.43	5.35	3.72

Table 2

Assessments at the Face												
Run Number/ SN	Antenna	Freq. (MHz)	Battery	Test position	Carry Case	Additional attachments	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)
Assessment across the band												
JsT-Face-060324-07/0277GD1253	PMAE4019 A	403.025	PMNN4071 A	Front at 2.5cm	None	None	4.70	-0.0571	4.91	3.64	2.49	1.84
*JsT-Face-060324-08/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Front at 2.5cm	None	None	4.67	-0.391	6.69	4.94	3.66	2.70
JsT-Face-060324-09/0277GD1253	PMAE4019 A	424.975	PMNN4071 A	Front at 2.5cm	None	None	4.65	-0.395	3.73	2.77	2.04	1.52

*Assessment with the worst case test configuration above using the full DASY 4 coarse and 7x7x7 cube scan measurements.												
JsT-Face-060324-10/0277GD1253	PMAE4019 A	414.025	PMNN4071 A	Front at 2.5cm	None	None	4.69	-0.538	6.35	4.53	3.59	2.56
JsT-Face-060324-11/0277GD1253 (Shortened scan)	PMAE4019 A	414.025	PMNN4071 A	Front at 2.5cm	None	None	4.65	-0.305	7.15	5.15	3.84	2.76

9.1 Highest SAR results calculation methodology

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

$$\text{Max. Calc. 1-g/10-g Avg. SAR} = ((\text{SAR meas.} / (10^{(\text{Pdrift}/10)})) * (\text{Pmax}/\text{Pint})) * \text{DC}\%$$

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 SAR (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 SAR values found for FCC ID: AZ489FT4872 models PMUE2736A/AAH84QCJ8AA1AN.

At the Body: 1-g Avg. = 6.00W/kg; 10-g Avg. = 4.16W/kg

At the Face: 1-g Avg. = 3.84W/kg; 10-g Avg. = 2.76W/kg

These test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8.0W/kg** 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

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e = f(d,k)</i>	<i>f</i>	<i>g</i>	<i>h =</i> <i>c x f / e</i>	<i>i =</i> <i>c x g / e</i>	<i>k</i>
Uncertainty Component	IEEE 1528 section	Tol. (± %)	Prob Dist	Div.	<i>c_i</i> (1 g)	<i>c_i</i> (10 g)	1 g <i>u_i</i> (±%)	10 g <i>u_i</i> (±%)	<i>v_i</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	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	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	411
Expanded Uncertainty (95% CONFIDENCE LEVEL)			<i>k</i> =2				22	22	

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

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e = f(d,k)</i>	<i>f</i>	<i>g</i>	<i>h =</i> <i>c x f / e</i>	<i>i =</i> <i>c x g / e</i>	<i>k</i>
Uncertainty Component	IEEE 1528 section	Tol. (± %)	Prob. Dist.	Div.	<i>c_i</i> (1 g)	<i>c_i</i> (10 g)	1 g <i>u_i</i> (±%)	10 g <i>u_i</i> (±%)	<i>v_i</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)			<i>k</i> =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) *c_i* - sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
- g) *u_i* – SAR uncertainty
- h) *v_i* - degrees of freedom for standard uncertainty and effective degrees of freedom for the expanded uncertainty.

Appendix B

Probe Calibration Certificates

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



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
C 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: **ET3-1384_May05**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1384**

Calibration procedure(s) **QA CAL-01.v5 and QA CAL-12.v4
Calibration procedure for dosimetric E-field probes**

Calibration date: **May 26, 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 $(22 \pm 3)^{\circ}\text{C}$ 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	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
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-05 (METAS, No. 251-00467)	May-06
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
RF generator HP 8648C	US3642UD1700	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

Calibrated by:	Name Nico Vetterli	Function Laboratory Technician	Signature
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Approved by:	Katja Pokovic	Technical Manager	
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Issued: May 26, 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
S 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
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- 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
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z}** = NORM_{x,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*.
- DCP_{x,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 $f \leq 800$ 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 NORM_{x,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:1384

May 26, 2005

DASY - Parameters of Probe: ET3DV6 SN:1384**Sensitivity in Free Space^A****Diode Compression^B**

NormX	1.78 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	92 mV
NormY	1.76 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	92 mV
NormZ	1.94 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	92 mV

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	10.1	5.1
SAR _{be} [%]	With Correction Algorithm	0.1	0.2

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	14.5	9.5
SAR _{be} [%]	With Correction Algorithm	1.0	0.1

Sensor Offset
 Probe Tip to Sensor Center **2.7 mm**

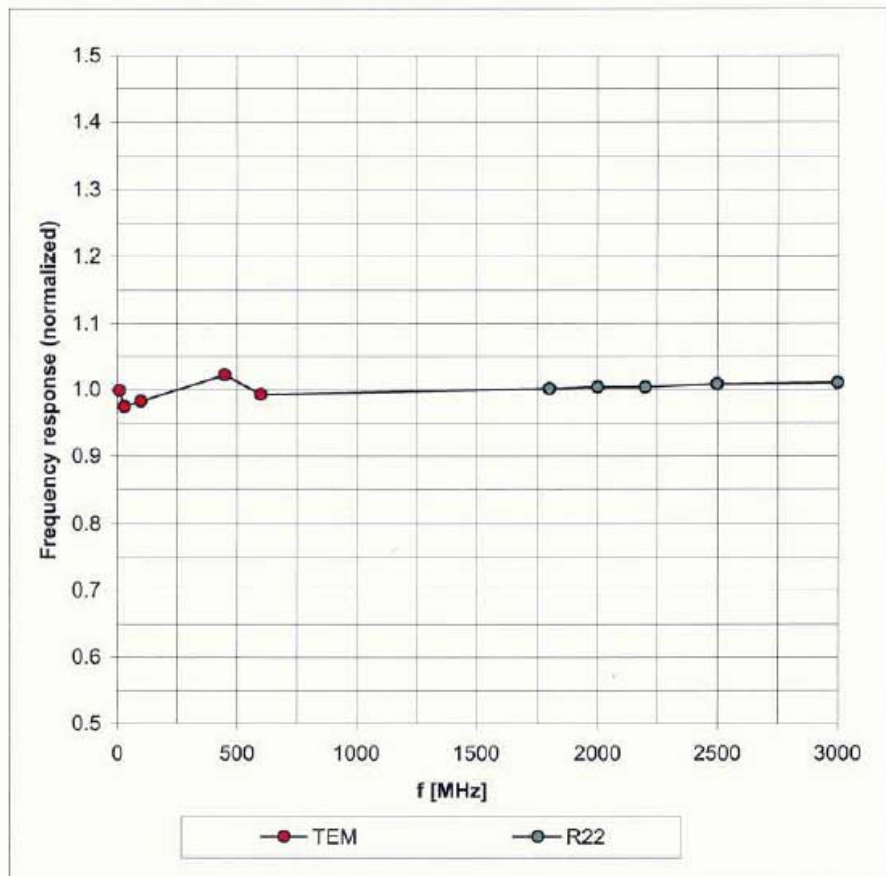
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

ET3DV6 SN:1384

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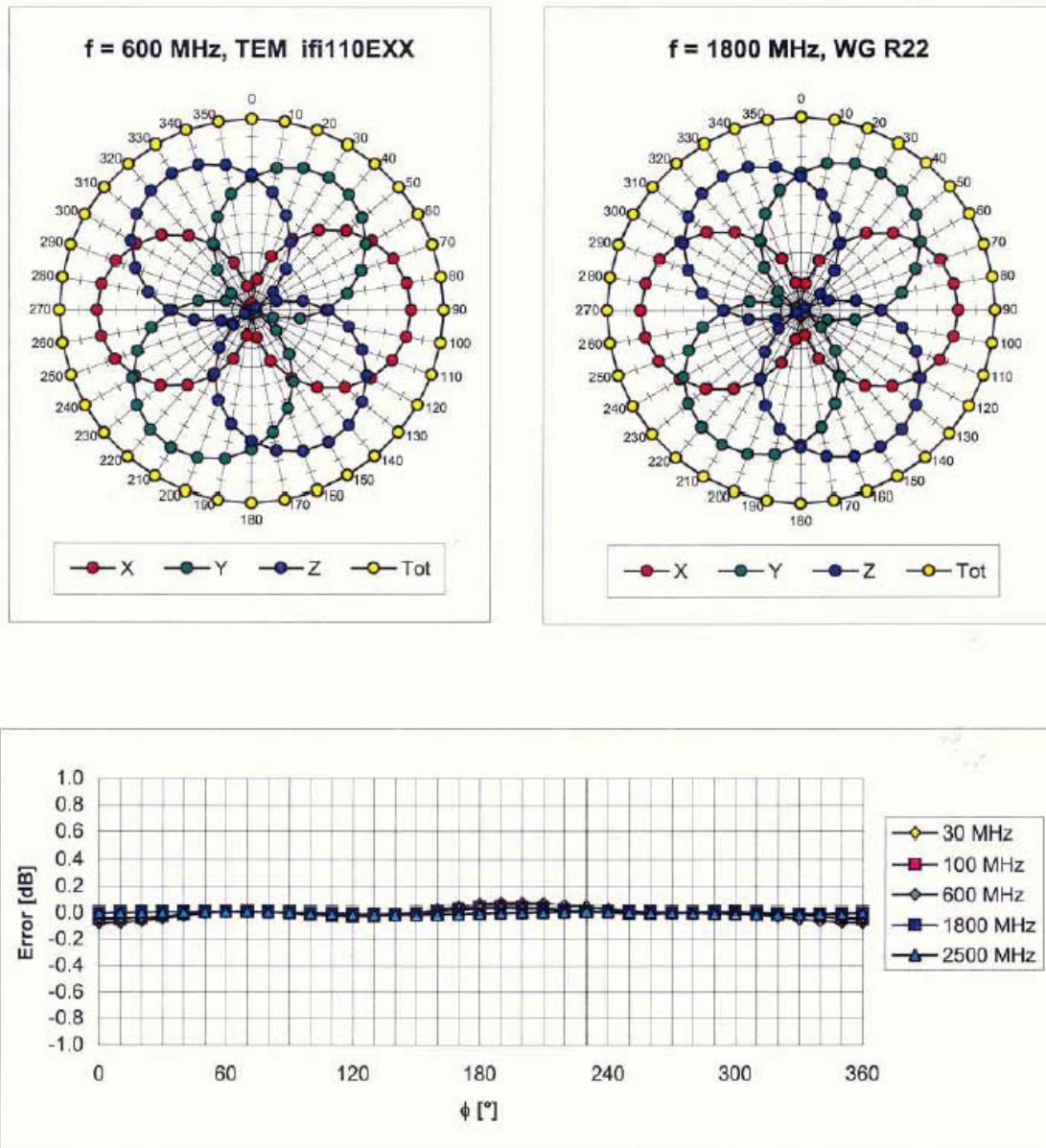
Frequency Response of E-Field

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

Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

ET3DV6 SN:1384

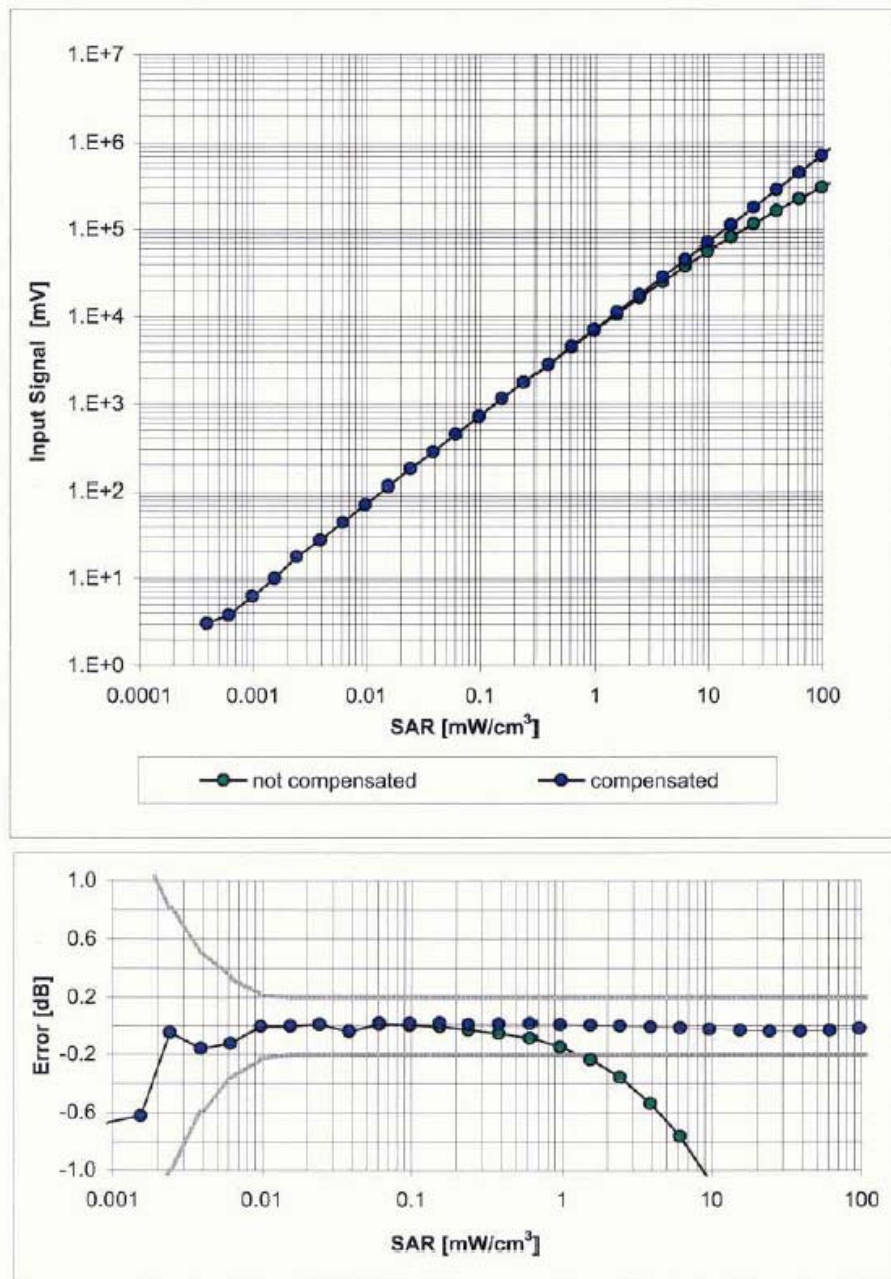
May 26, 2005

Receiving Pattern (ϕ), $\vartheta = 0^\circ$ **Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)**

ET3DV6 SN:1384

May 26, 2005

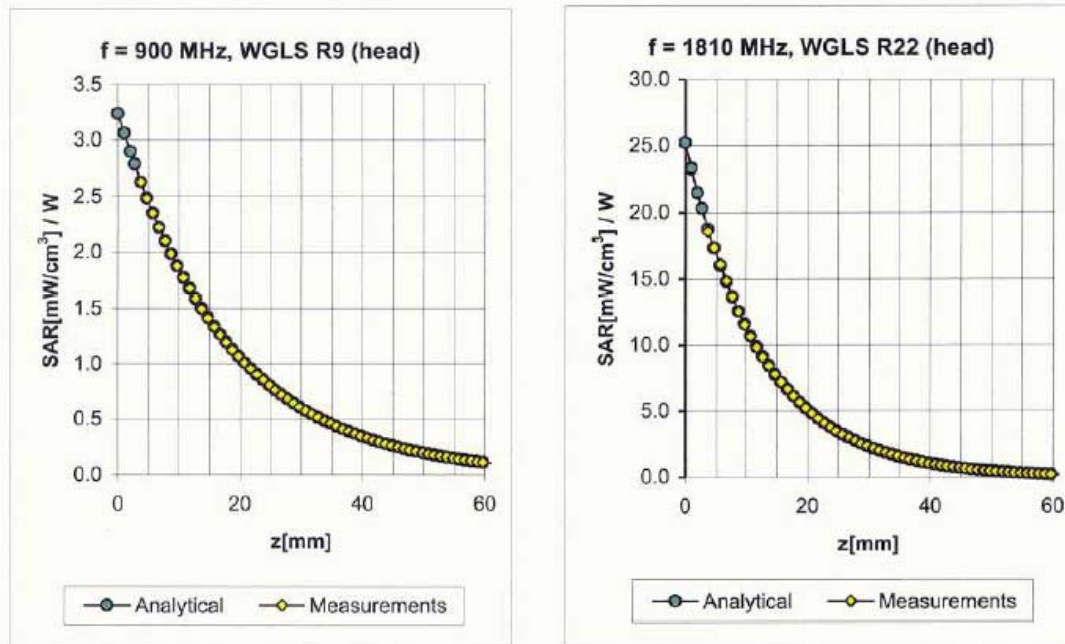
Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800$ MHz)

Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6 SN:1384

May 26, 2005

Conversion Factor Assessment



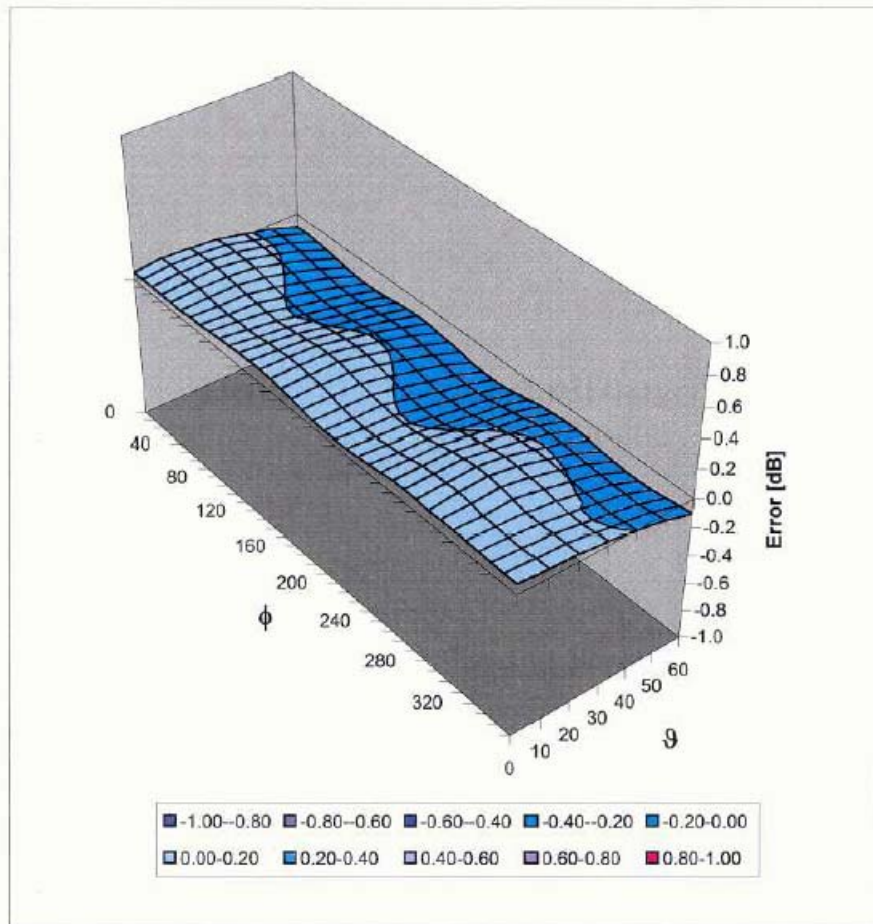
f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.08	1.62	7.51 ± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.84	1.67	6.53 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.73	2.19	5.31 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.81	2.05	4.71 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.10	1.75	7.10 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.66	1.95	6.19 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.67	2.58	4.80 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.93	1.80	4.46 ± 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:1384

May 26, 2005

Deviation from Isotropy in HSL

Error (ϕ , θ), $f = 900$ MHz**Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)**

Appendix C

Dipole Calibration Certificates

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

Client **Motorola CGISS**

CALIBRATION CERTIFICATE

Object(s) D450V2 - SN:1001

Calibration procedure(s) QA CAL-15.v2
Calibration procedure for dipole validation kits below 800 MHz

Calibration date: May 22, 2004

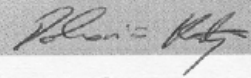
Condition of the calibrated item In Tolerance (according to the specific calibration document)

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	5-May-04 (METAS, No 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No 251-00388)	May-05
Reference 20 dB Attenuator	SN: 5086 (20b)	3-May-04 (METAS, No 251-00389)	May-05
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: May 24, 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:1001

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	$\pm 5\%$
Conductivity	0.85 mho/m	$\pm 5\%$

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 $398 \text{ mW} \pm 3 \%$. 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: $5.28 \text{ mW/g} \pm 20.7 \% (k=2)^1$

averaged over 10 cm^3 (10 g) of tissue: $3.52 \text{ mW/g} \pm 20.2 \% (k=2)^1$

D450V2- SN:1001

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:	1.346 ns	(one direction)
Transmission factor:	0.991	(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:	$\text{Re}\{Z\} = 53.0 \, \Omega$
	$\text{Im}\{Z\} = -11.1 \, \Omega$
Return Loss at 450 MHz	-19.2 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.

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 450 MHz; Serial: D450V2 - SN:1001

Communication System: CW; Duty Cycle: 1:1; Medium: HSL450

Medium parameters used: $f = 450$ MHz; $\sigma = 0.85$ mho/m; $\epsilon_r = 45.1$; $\rho = 1000$ kg/m³

Phantom: Flat Phantom 4.4; Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.45, 6.45, 6.45);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Measurement SW: DASY4, V4.2 Build 44;

d=15mm, Pin=398mW/Area Scan (71x181x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 52.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 2.21 mW/g

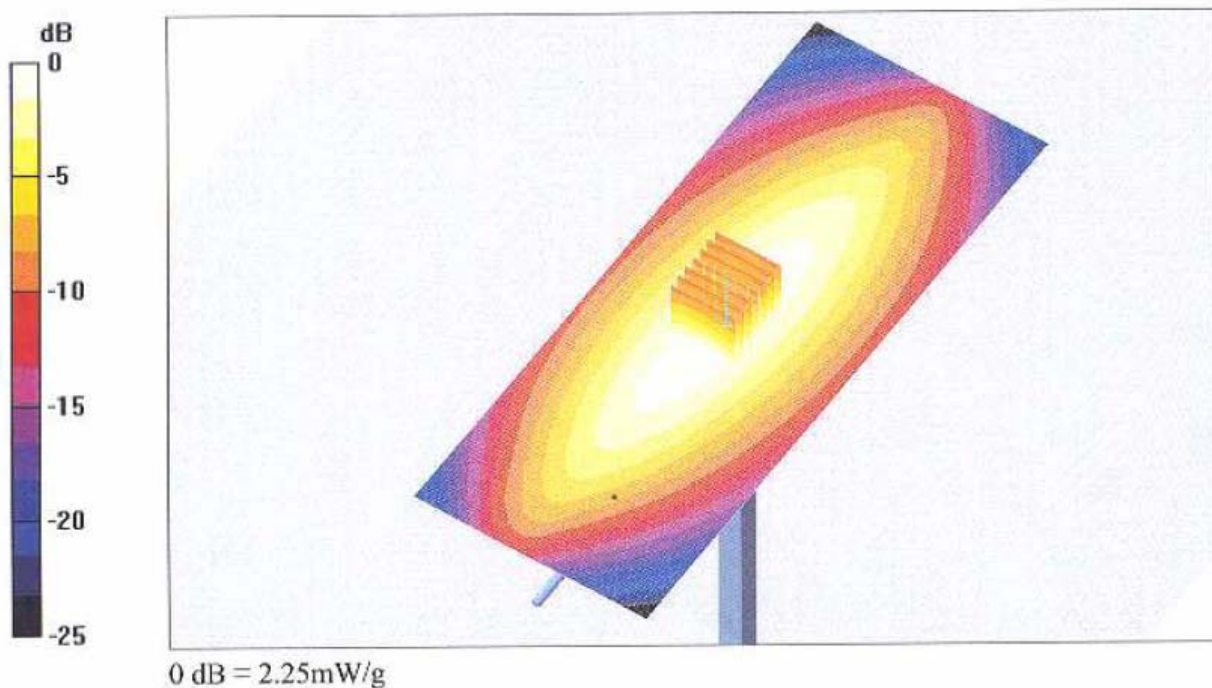
d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 2.25 mW/g

Peak SAR (extrapolated) = 3.18 W/kg

SAR(1 g) = 2.1 mW/g; SAR(10 g) = 1.4 mW/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 1001; Test Date: 3/22/06**

Run #: JsT-SYSP-450B-060322-01 Sim.Tissue Temp: 20.4 (C)

TX Freq: 450 (MHz) Start power: 250 (mW)

Target: 4.96 mW/g for 1g SAR 3.25 mW/g for 10g SAR

5.18 mW/g calculated 1g-SAR; 4.40% from target (including drift)

3.38 mW/g calculated 10g-SAR; 3.96% from target (including drift)

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.1, 7.1, 7.1)

Duty Cycle: 1:1, Medium: Body 450, Medium parameters used: $f = 450$ MHz; $\sigma = 0.95$ mho/m; $\epsilon_r = 58.1$; $\rho = 1000$ kg/m³

Electronics: DAE3 Sn406, Calibrated: 11/21/2005

System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 37.8 V/m; Power Drift = 0.00155 dB

Peak SAR (extrapolated) = 2.19 W/kg

SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.837 mW/g

Maximum value of SAR (measured) = 1.36 mW/g

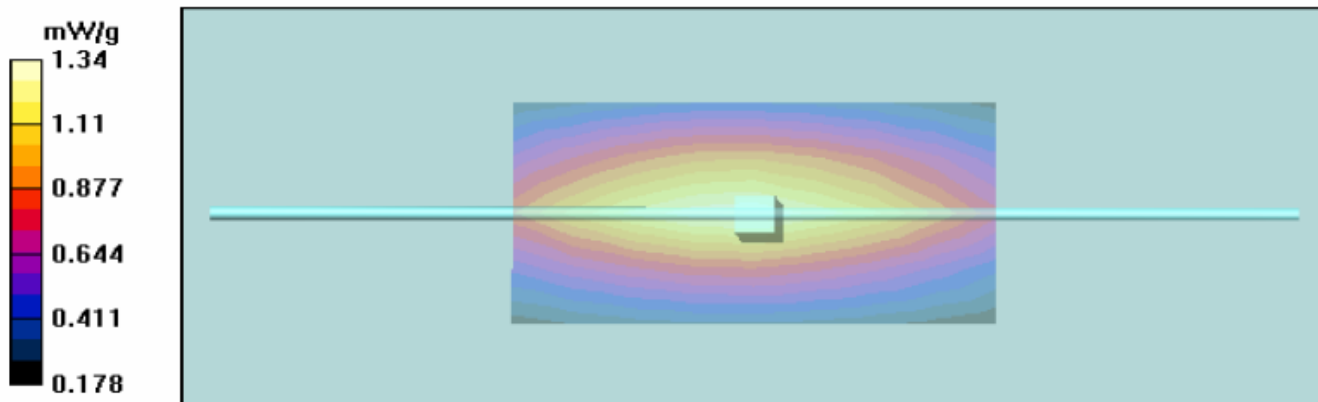
System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 37.8 V/m; Power Drift = 0.00155 dB

Peak SAR (extrapolated) = 2.21 W/kg

SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.852 mW/g

Maximum value of SAR (measured) = 1.37 mW/g



Motorola GEMS EME Lab**SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 3/23/06**

Run #: ErC-SYSP-450B-060323-01 Sim.Tissue Temp: 20.5 (C)

TX Freq: 450 (MHz) Start power: 250 (mW)

Target: 4.96 mW/g for 1g SAR 3.25 mW/g for 10g SAR

5.08 mW/g calculated 1g-SAR; 2.38% from target (including drift)

3.31 mW/g calculated 10g-SAR; 1.87% from target (including drift)

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.1, 7.1, 7.1),

Duty Cycle: 1:1, Medium: Body 450, Medium parameters used: $f = 450$ MHz; $\sigma = 0.94$ mho/m; $\epsilon_r = 57.8$; $\rho = 1000$ kg/m³ ;

Electronics: DAE3 Sn406, Calibrated: 11/21/2005

System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 37.8 V/m; Power Drift = 0.00163 dB

Peak SAR (extrapolated) = 2.15 W/kg

SAR(1 g) = 1.26 mW/g; SAR(10 g) = 0.822 mW/g

Maximum value of SAR (measured) = 1.34 mW/g

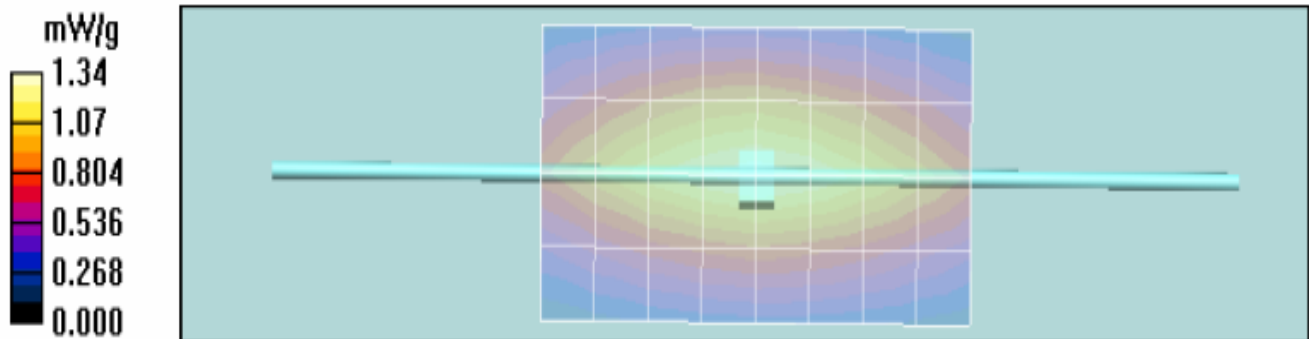
System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 37.8 V/m; Power Drift = 0.00163 dB

Peak SAR (extrapolated) = 2.20 W/kg

SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.834 mW/g

Maximum value of SAR (measured) = 1.36 mW/g



Motorola GEMS EME Lab**SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 3/24/06**

Run #: ErC-SYSP-450B-060324-01 Sim.Tissue Temp: 20.9 (C)

TX Freq: 450 (MHz) Start power: 250 (mW)

Target: 4.96 mW/g for 1g SAR 3.25 mW/g for 10g SAR

5.07 mW/g calculated 1g-SAR; 2.16% from target (including drift)

3.30 mW/g calculated 10g-SAR; 1.65% from target (including drift)

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.1, 7.1, 7.1),

Duty Cycle: 1:1, Medium: Body 450, Medium parameters used: $f = 450$ MHz; $\sigma = 0.94$ mho/m; $\epsilon_r = 57.6$; $\rho = 1000$ kg/m³ ;

Electronics: DAE3 Sn406, Calibrated: 11/21/2005

System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 38.0 V/m; Power Drift = 0.0108 dB

Peak SAR (extrapolated) = 2.18 W/kg

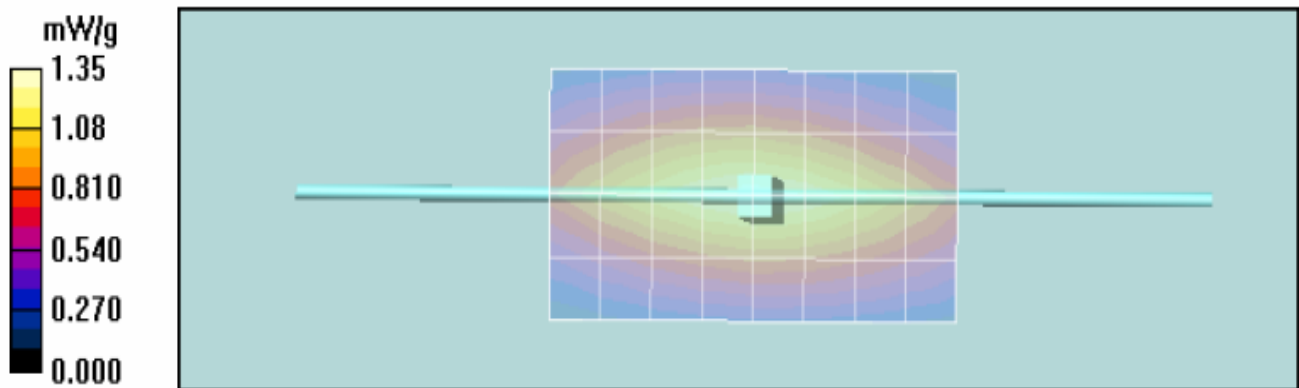
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.823 mW/g

Maximum value of SAR (measured) = 1.34 mW/g

System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 38.0 V/m; Power Drift = 0.0108 dB

Peak SAR (extrapolated) = 2.16 W/kg

SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.832 mW/g

Motorola GEMS EME Lab**SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 3/27/06**

Run #: ErC-SYSP-450H-060327-01 Sim.Tissue Temp: 21.5 (C)

TX Freq: 450 (MHz) Start power: 250 (mW)

Target: 4.76 mW/g for 1g SAR 3.10 mW/g for 10g SAR

4.82 mW/g calculated 1g-SAR; 1.21% from target (including drift)

3.12 mW/g calculated 10g-SAR; 0.64% from target (including drift)

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.51, 7.51, 7.51),

Duty Cycle: 1:1, Medium: 450 IEEE Head, Medium parameters used: $f = 450$ MHz; $\sigma = 0.87$ mho/m; $\epsilon_r = 44.5$; $\rho = 1000$ kg/m³; Electronics: DAE3 Sn406, Calibrated: 11/21/2005**System Performance Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 38.5 V/m; Power Drift = 0.0557 dB

Peak SAR (extrapolated) = 2.07 W/kg

SAR(1 g) = 1.2 mW/g; SAR(10 g) = 0.776 mW/g

Maximum value of SAR (measured) = 1.27 mW/g

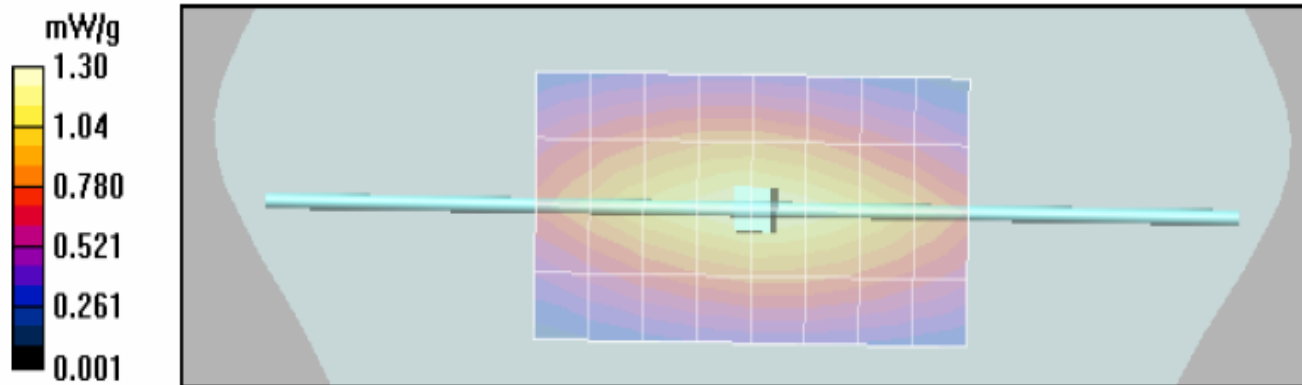
System Performance Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm; Reference Value = 38.5 V/m; Power Drift = 0.0557 dB

Peak SAR (extrapolated) = 2.12 W/kg

SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.804 mW/g

Maximum value of SAR (measured) = 1.31 mW/g



SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	<u>8/5/2005</u>	Frequency (MHz):	<u>450</u>
Lab Location:	<u>GEMS EME</u>	Mixture Type:	<u>FCC Body</u>
Robot System:	<u>GEMS-3</u>	Ambient Temp.(°C):	<u>22.3</u>
Probe Serial #:	<u>1393</u>	Tissue Temp.(°C):	<u>20.5</u>
DAE Serial #:	<u>363</u>		

Tissue Characteristics

Permittivity:	<u>54.4</u>	Phantom Type/SN:	<u>80302002D-S14</u>
Conductivity:	<u>0.92</u>	Distance (mm):	<u>15</u>

Reference Source:	<u>Dipole</u>	(Dipole)
Reference SN:	<u>1001</u>	

Power to Dipole: 250 mW

Measured SAR Value:	<u>1.24</u> mW/g,	<u>0.812</u> mW/g (10g avg.)
Power Drift:	<u>-0.000604</u> dB	

New Target/Measured

SAR Value:	<u>4.96</u> mW/g,	<u>3.25</u> mW/g (10g avg.)
(normalized to 1.0 W, including drift)		

Test performed by: E. Church Initial: ERC

Sys. Per. Chk. Form: 021024

DUT: Dipole 450 MHz

Run #: ErC-VAL-450B-050805-02

Sim.Tissue Temp: 20.5 (C)

Robot # GEMS-3

Phantom #: 80302002D-S14

Model #: D450V2

S/N: 1001

TX Freq: 450 (MHz)

Start power: 250 (mW)

Target:

New Body Target:

4.96 mW/g for 1g SAR 3.25 mW/g for 10g SAR

Probe: ET3DV6 - SN1393, Calibrated: 5/20/2005, ConvF(7.18, 7.18, 7.18).

Duty Cycle: 1:1, Medium: 450 MHz Body, Medium parameters used: $\sigma = 0.92$ mho/m, $\epsilon_r = 54.4$; $\rho = 1000$ kg/m³;

Electronics: DAE3 Sn363, Calibrated: 5/24/2005

Dipole Validation 450 Body/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 37.9 V/m; Power Drift = -0.000604 dB

Peak SAR (extrapolated) = 2.06 W/kg

SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.812 mW/g

Maximum value of SAR (measured) = 1.31 mW/g

Dipole Validation 450 Body/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm

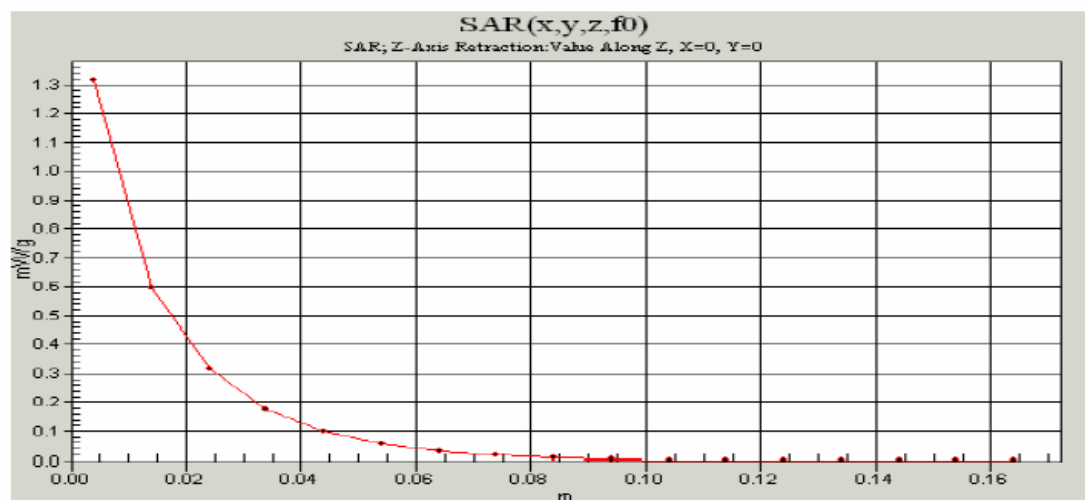
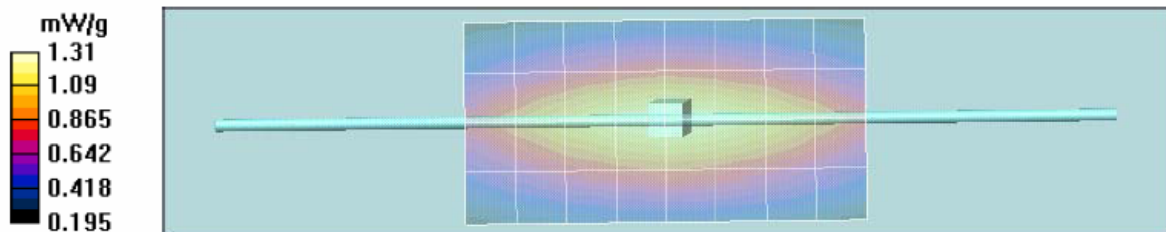
Reference Value = 37.9 V/m; Power Drift = -0.000604 dB

Peak SAR (extrapolated) = 2.06 W/kg

SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.812 mW/g

Dipole Validation 450 Body/Dipole Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm**Dipole Validation 450 Body/Z-Axis Retraction (1x1x17):** Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 1.32 mW/g



SYSTEM PERFORMANCE CHECK TARGET SAR

Date:	<u>8/5/2005</u>	Frequency (MHz):	<u>450</u>
Lab Location:	<u>GEMS EME</u>	Mixture Type:	<u>IEEE Head</u>
Robot System:	<u>GEMS-3</u>	Ambient Temp.(°C):	<u>22.4</u>
Probe Serial #:	<u>1393</u>	Tissue Temp.(°C):	<u>20.7</u>
DAE Serial #:	<u>363</u>		

Tissue Characteristics

Permittivity:	<u>43.0</u>	Phantom Type/SN:	<u>80302002A-S7</u>
Conductivity:	<u>0.85</u>	Distance (mm):	<u>15</u>

Reference Source:	<u>Dipole</u>	(Dipole)
Reference SN:	<u>1001</u>	

Power to Dipole: 250 mW

Measured SAR Value:	<u>1.18</u> mW/g,	<u>0.769</u> mW/g (10g avg.)
Power Drift:	<u>-0.0337</u> dB	

New Target/Measured

SAR Value:	<u>4.76</u> mW/g,	<u>3.10</u> mW/g (10g avg.)
------------	-------------------	-----------------------------

(normalized to 1.0 W, including drift)

Test performed by: E. Church Initial: ERC

Sys. Per. Chk. Form: 021024

DUT: Dipole 450 MHz

Run #: ErC-VAL-450H-050805-01

Sim.Tissue Temp: 20.7 (C)

Robot # GEMS-3

Phantom #: 80302002A-S7

Model #: D450V2

S/N: 1001

TX Freq: 450 (MHz)

Start power: 250 (mW)

Target:

New Head Target: +/- 10% From IEEE Head Target

4.76 mW/g for 1g SAR 3.10 mW/g for 10g SAR

Probe: ET3DV6 - SN1393, Calibrated: 5/20/2005, ConvF(7.58, 7.58, 7.58),

Duty Cycle: 1:1, Medium: 450 MHz Head, Medium parameters used: $\sigma = 0.85$ mho/m, $\epsilon_r = 43$; $\rho = 1000$ kg/m³;

Electronics: DAE3 Sn363, Calibrated: 5/24/2005

Dipole Validation 450 Head/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 38.0 V/m; Power Drift = -0.0337 dB

Peak SAR (extrapolated) = 2.00 W/kg

SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.767 mW/g

Maximum value of SAR (measured) = 1.25 mW/g

Dipole Validation 450 Head/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 38.0 V/m; Power Drift = -0.0337 dB

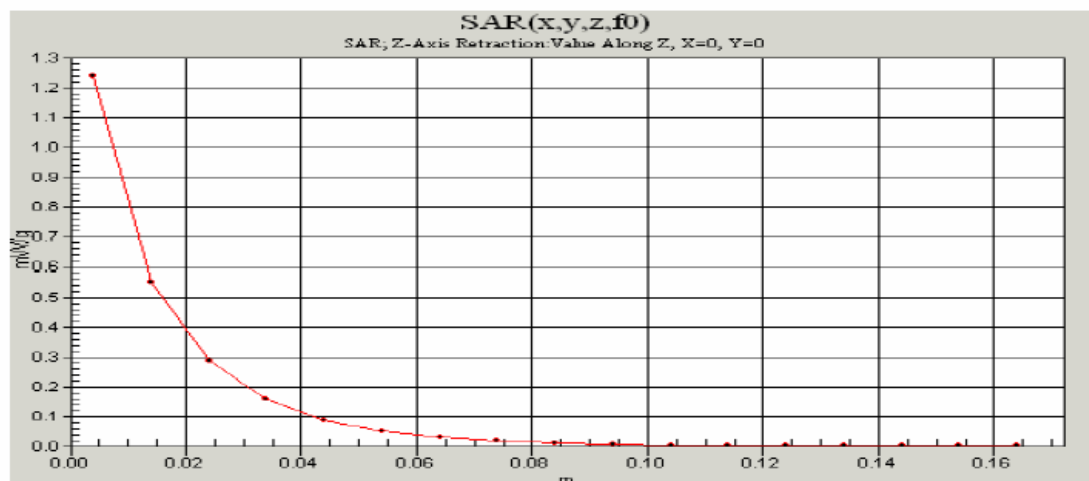
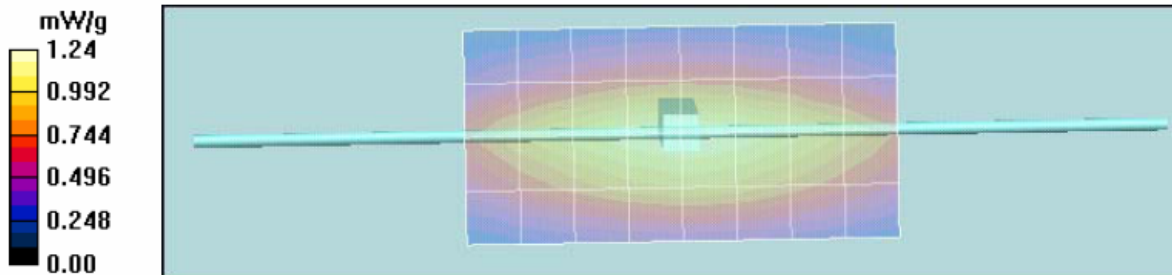
Peak SAR (extrapolated) = 2.00 W/kg

SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.769 mW/g

Maximum value of SAR (measured) = 1.22 mW/g

Dipole Validation 450 Head/Dipole Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm**Dipole Validation 450 Head/Z-Axis Retraction (1x1x17):** Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 1.24 mW/g



Appendix E

DUT Scans (Shortened scans & Highest SAR configurations)

Shortened Scan Results

Motorola GEMS EME Laboratory

Test Date: 3/24/06

Run #: JsT-Ab-060324-06 Sim. Tissue Temp: 20.6 (C)

Model #: PMUE2736A/AAH84QCJ8AA1AN SN: 0277GD1253

Antenna: PMAE4019A TX Freq: 403.025 MHz

Battery: PMNN4071A Start power: 4.67 W

Carry acc.: PMLN4691A Audio/Data acc.: PMLN4658A

Comments: Shortened Scan

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.1, 7.1, 7.1)

Duty Cycle: 1:1, Medium: 414 MHz FCC Body , Medium parameters used: $f = 414$ MHz; $\sigma = 0.91$ mho/m; $\epsilon_r = 58.2$; $\rho = 1000$ kg/m³; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

Ab Template/5x5x7 Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5$ mm, $dy=7.5$ mm, $dz=5$ mm

Reference Value = 111.4 V/m; Power Drift = 0.0043 dB

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 10.7 mW/g; SAR(10 g) = 7.43 mW/g

Maximum value of SAR (measured) = 11.1 mW/g

Ab Template/Area Scan (51x141x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Reference Value = 111.4 V/m; Power Drift = 0.0043 dB

Comments: Short Scan at the body w/ body worn accessory against phantom

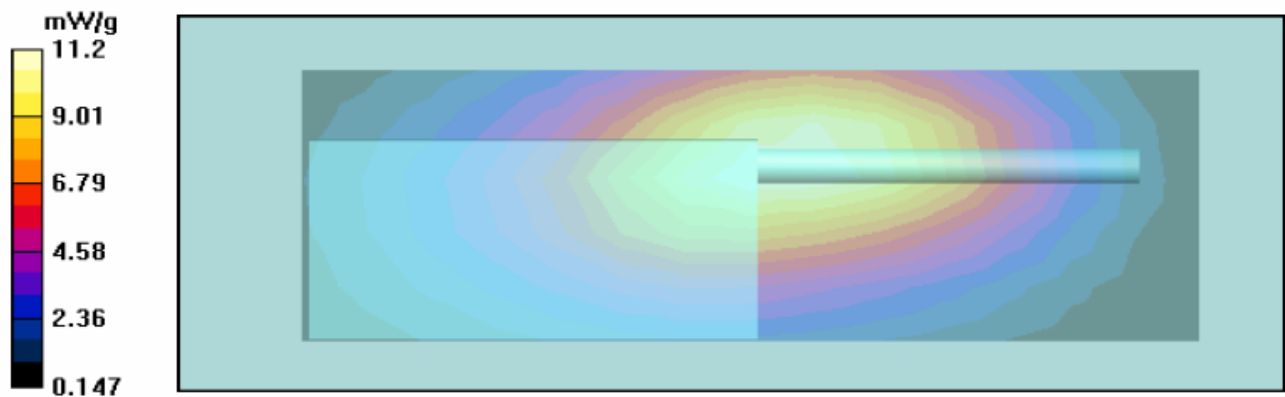
Shortened scan reflect highest SAR producing configuration at the body; Run time 7 minutes.

Representative “normal” scan run time was 24 minutes

“Shortened” scan max calculated SAR using SAR drift: 1-g Avg. = 5.35mW/g; 10-g Avg. = 3.72mW/g

“Normal” scan max calculated SAR using SAR drift: 1-g Avg. = 6.00mW/g; 10-g Avg. = 4.16mW/g

(see section 9.0 run # JsT-Ab-060324-05)



Motorola GEMS EME Laboratory**Test Date: 3/24/06**

Run #: JsT-Face-060324-11 Sim. Tissue Temp: 20.6 (C)

Model #: PMUE2736A/AAH84QCJ8AA1AN SN: 0277GD1253

Antenna: PMAE4019A TX Freq: 414.025 MHz

Battery: PMNN4071A Start power: 4.65 W

Carry acc.: None Audio/Data acc.: None

Comments: **Shortened Scan (highest result at face);** Unit front @ 2.5cm

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.51, 7.51, 7.51)

Duty Cycle: 1:1, Medium: 414 IEEE Head, Medium parameters used: $f = 414$ MHz; $\sigma = 0.85$ mho/m; $\epsilon_r = 45.9$; $\rho = 1000$ kg/m³; Electronics: DAE3 Sn406, Calibrated: 11/21/2005**Face Template/5x5x7 Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 93.1 V/m; Power Drift = -0.305 dB

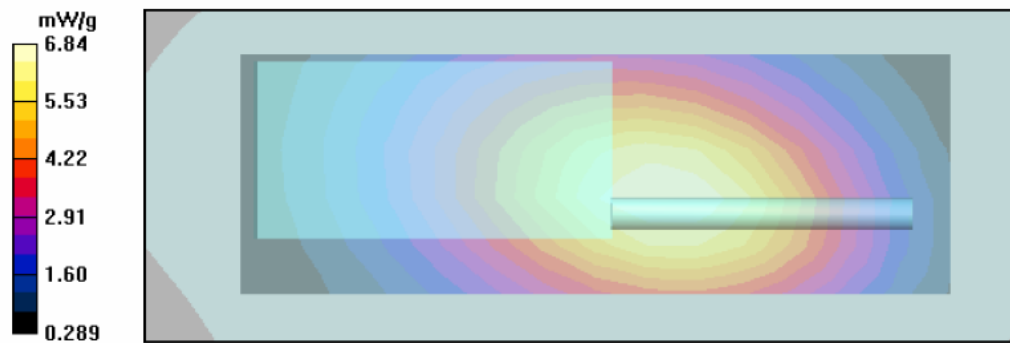
Peak SAR (extrapolated) = 10.9 W/kg

SAR(1 g) = 7.15 mW/g; SAR(10 g) = 5.15 mW/g

Maximum value of SAR (measured) = 7.45 mW/g

Face Template/Area Scan (51x141x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 93.1 V/m; Power Drift = -0.305 dB

Comments: Short Scan at the face with 2.5cm separation**Shortened scan reflect highest SAR producing configuration at the face; Run time 7 minutes.****Representative “normal” scan run time was 24 minutes****“Shortened” scan max calculated SAR using SAR drift: 1-g Avg. = 3.84mW/g; 10-g Avg. = 2.76mW/g****“Normal” scan max calculated SAR using SAR drift: 1-g Avg. = 3.59mW/g; 10-g Avg. = 2.56mW/g****(see section 9.0 run # JsT-Face-060324-10)**

Highest SAR Configurations Results

Motorola GEMS EME Laboratory

Test Date: 3/24/06

Run #: JsT-Ab-060324-05 Sim. Tissue Temp: 20.6 (C)

Model #: PMUE2736A/AAH84QCJ8AA1AN SN: 0277GD1253

Antenna: PMAE4019A TX Freq: 403.025 MHz

Battery: PMNN4071A Start power: 4.66 W

Carry acc.: PMLN4691A Audio/Data acc.: PMLN4658A

Comments: Full Scan

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.1, 7.1, 7.1)

Duty Cycle: 1:1, Medium: 414 MHz FCC Body , Medium parameters used: $f = 414$ MHz; $\sigma = 0.91$ mho/m; $\epsilon_r = 58.2$; $\rho = 1000$ kg/m³; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

Ab Template/7x7x7 Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 112.5 V/m; Power Drift = 0.397 dB

Peak SAR (extrapolated) = 19.0 W/kg

SAR(1 g) = 12 mW/g; SAR(10 g) = 8.32 mW/g

Maximum value of SAR (measured) = 12.6 mW/g

Ab Template/Area Scan (51x141x1): Measurement grid: dx=15mm, dy=15mm

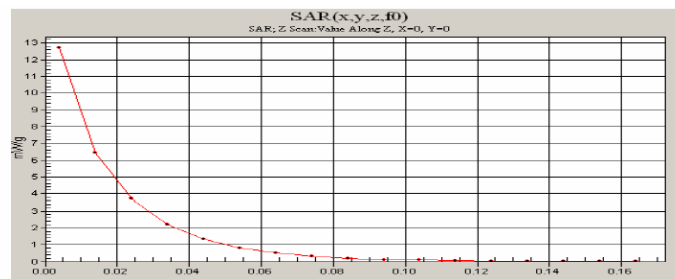
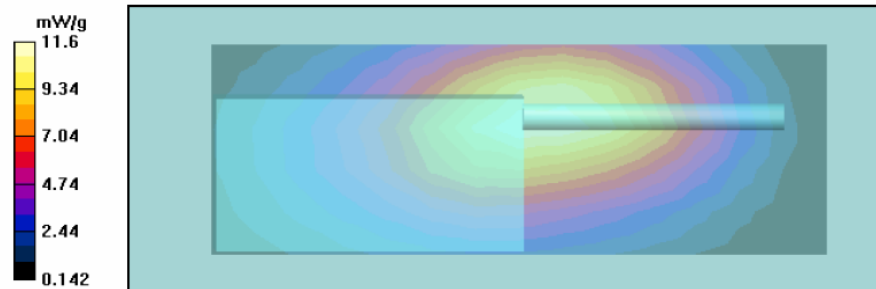
Reference Value = 112.5 V/m; Power Drift = 0.397 dB

Motorola Fast SAR: SAR(1 g) = 11.2 mW/g; SAR(10 g) = 8.23 mW/g

Maximum value of SAR (interpolated) = 11.9 mW/g

Ab Template/Z Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 12.7 mW/g



Motorola GEMS EME Laboratory**Test Date: 3/24/06**

Run #: JsT-Face-060324-10 Sim. Tissue Temp: 20.5 (C)

Model #: PMUE2736A/AAH84QCJ8AA1AN SN: 0277GD1253

Antenna: PMAE4019A TX Freq: 414.025 MHz

Battery: PMNN4071A Start power: 4.69 W

Carry acc.: None Audio/Data acc.: None

Comments: Full Scan; Unit front @ 2.5cm

Probe: ET3DV6 - SN1384, Calibrated: 5/26/2005, ConvF(7.51, 7.51, 7.51)

Duty Cycle: 1:1, Medium: 414 IEEE Head, Medium parameters used: $f = 414$ MHz; $\sigma = 0.85$ mho/m; $\epsilon_r = 45.9$; $\rho = 1000$ kg/m³; Electronics: DAE3 Sn406, Calibrated: 11/21/2005**Face Template/7x7x7 Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.6 V/m; Power Drift = -0.538 dB

Peak SAR (extrapolated) = 9.94 W/kg

SAR(1 g) = 6.35 mW/g; SAR(10 g) = 4.53 mW/g

Maximum value of SAR (measured) = 6.66 mW/g

Face Template/Area Scan (51x141x1): Measurement grid: dx=15mm, dy=15mm

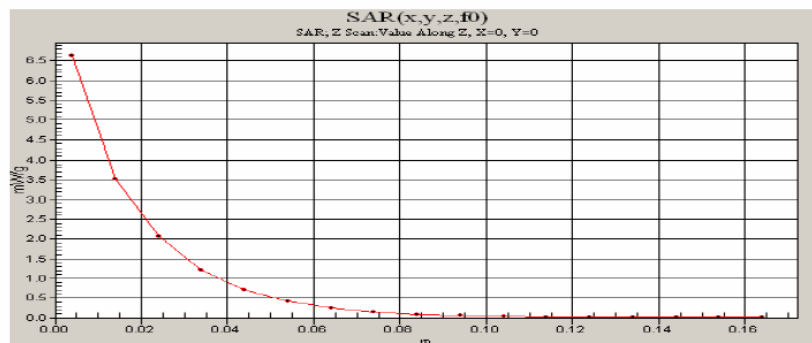
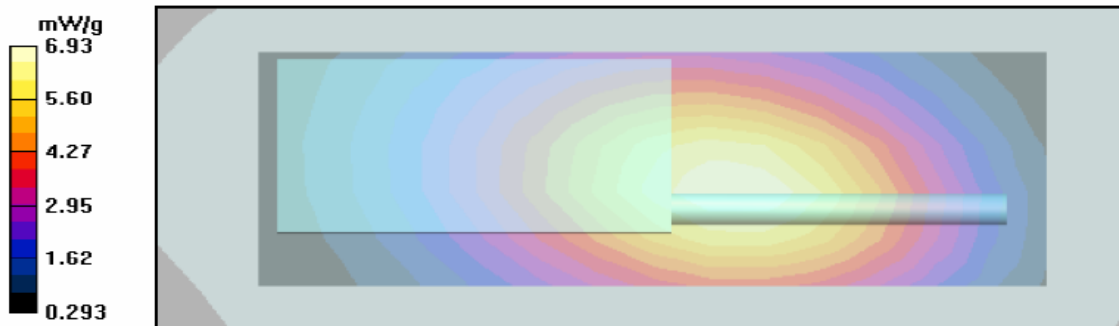
Reference Value = 92.6 V/m; Power Drift = -0.538 dB

Motorola Fast SAR: SAR(1 g) = 6.68 mW/g; SAR(10 g) = 4.94 mW/g

Maximum value of SAR (interpolated) = 7.03 mW/g

Face Template/Z Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 6.63 mW/g



APPENDIX F
DUT Supplementary Data (Power slump)

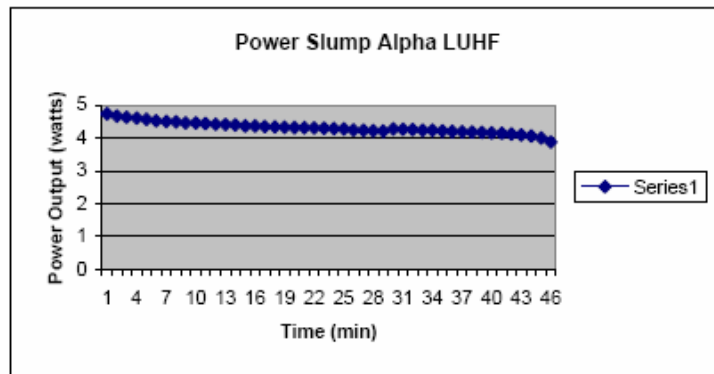
Power Slump For Alpha L UHF PMUE2736A SR3785

Serial # 0277GD1253, Battery PMNN4071A,

Frequency 403.025 MHz., PMLN4658A D shell Earset w/boom mic w/PTT/VOX

MINUTES POWER (WATTS)

Start (0)	4.73
1	4.66
2	4.63
3	4.6
4	4.57
5	4.52
6	4.5
7	4.49
8	4.46
9	4.46
10	4.44
11	4.42
12	4.41
13	4.4
14	4.37
15	4.37
16	4.35
17	4.34
18	4.33
19	4.32
20	4.32
21	4.30
22	4.29
23	4.28
24	4.27
25	4.24
26	4.23
27	4.22
28	4.21
29	4.27
30	4.26
31	4.25
32	4.23
33	4.23
34	4.21
35	4.20
36	4.19
37	4.18
38	4.17
39	4.15
40	4.14
41	4.12
42	4.09
43	4.06
44	4.00
45	3.88



Appendix G

DUT Test Position Photos

Figure 1: Highest SAR Test Position (Body)
DUT w/ belt clip PMLN4691A against the phantom; worst case audio accessory PMLN4658A attached
(same position used for all other audio/data accessories)



Figure 2: Highest SAR Test Position (face)
DUT w/ front side separated 2.5cm from the phantom



Appendix H DUT and Accessory Photos

The purpose of this appendix is to illustrate the offered body-worn carry accessory(ies). The sample that was used in the following photos represents the product used to obtain the results presented herein.



Photo 1.
Model PMLN4691A
Back View



Photo 2.
Model PMLN4691A
Side View



Photo 3.
Model PMLN4741A
Back View



Photo 4.
Model PMLN4741A
Front View



Photo 5.
Model PMLN4741A
Side View



Photo 6.
Model PMLN4742A
Back View



Photo 7.
Model PMLN4742A
Front View



Photo 8.
Model PMLN4742A
Side View



Photo 9.
Model PMLN4743A
Side View



Photo 10.
Model PMLN4743A
Back View

Appendix I

DUT Body-worn Separation Distances

The following table summarizes the test status and separation distance provided by each of the applicable body-worn accessory(ies):

Carry Case Models	Tested ?	Min. Separation distances between DUT antenna and phantom surface. (mm)	Comments
PMLN4743A	Yes	30-45	
PMLN4742A	Yes	77-118	
PMLN4741A	Yes	34-44	
PMLN4691A	Yes	20-22	

Audio Acc. Models	Tested ?	Separation distances between DUT antenna and phantom surface. (mm)	Comments
PMMN4008A	Yes	NA	NA
PMLN4442A	Yes	NA	NA
PMLN4444A	Yes	NA	NA
PMLN4294C	Yes	NA	NA
PMLN4606A	Yes	NA	NA
PMLN4605A	Yes	NA	NA
PMLN4658A	Yes	NA	NA
PMLN4443A	No	NA	Similar to PMLN4442A
PMLN4445A	No	NA	Similar to PMLN4444A