MOTOROLA

ACCREDITED

Certificate Number: 2518.01

FCC ID: AZ489FT4878
DECLARATION OF COMPLIANCE SAR ASSESSMENT

Networks & Enterprise
EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

Date of Report: 10/11/06
Report Revision: 0
Report ID: BPR40_Rev O_061011_SR4464

Responsible Engineer: Kim Uong (EME lead Eng.)
Date/s Tested: 10/3/06 – 10/6/06
Manufacturer/Location: Penang
Sector/Group/Div.: GEMS/GTDG
Date submitted for test: 9/26/06
DUT Description: BPR40 490-512MHz 4W 12.5/25K-16CH
Test TX mode(s): CW
Max. Power output: 4.5W
Nominal Power: 4.0W
Tx Frequency Bands: 490-512MHZ
Signaling type: FM
Model(s) Tested: AAH84TCJ8AA1AN
Model(s) Certified: AAH84TCJ8AA1AN
Serial Number(s): 0278GR1143
Classification: Occupational/ Controlled
Rule Part(s): 90

Approved Accessories:
Antenna(s):

PMAE4028A (490-512MHz 1/4 wave -3dBi)

Battery(ies):
PMNN4071A (1200mAH NiMH), PMNN4075A (1500mAH Li-Ion)

Body worn accessory(ies):

PMLN4743A (Spring Belt Clip), PMLN4741A (Soft Leather Carry Case) , PMLN4742A (Hard Leather Carry Case).

Audio/Data cable accessory(ies):
PMMN4013A (Yoda RSM with Jack), PMLN5011A (Temple Transducer Headset -2 pin), PMMN4008A (Remote Speaker) , PMLN4442A (Earbud with in-line mic and PTT/VOX), PMLN4443A (Ear Receiver with in-line mic and PTT/VOX switch), PMLN4444A (Earphone Boom mic with in-line mic and PTT/VOX switch), PMLN4445A (Ultra Lightweight Headset with in-line PTT/VOX Switch), PMLN4294D (Earbud with Microphone & PTT Combined), PMLN4606A (2-Wire Surveillance Kit with Clear Acoustic Tube), PMLN4605A (Clear Acoustic Kit), MLN4658A (D-shell Earset with Boom Mic with PTT/VOX Switch).

Max. Calc. : 1-g Avg. SAR: 6.99 W/kg (Body); 10-g Avg. SAR: 5.06 W/kg (Body)
Max. Calc. : 1-g Avg. SAR: 6.34 W/kg (Face); 10-g Avg. SAR: 4.59 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.

Signature on file – Ken Enger
Ken Enger N&E EME Lab Senior Resource Manager, Laboratory Director,

Approval Date: 10/11/06

Certification Date: 10/11/06

Certification No.: L1061022

Part 1 of 2

APPENDICES

Report Revision History

Date	Revision	Comments
10/11/06	O	Initial 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 N&E EME Test Lab for the model number AAH84TCJ8AA1AN of FCC ID: AZ489FT4878. The results herein reflect initial test results.

2.0 Referenced Standards and Guidelines

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

- IEC62209-1(2005) Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)
- 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) C95.1-2005 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: AZ489FT4878 is a handheld transceiver, which operates as a traditional simplex 2-way radio. 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 490-512 MHz 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. PTT operation at the body-worn 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 work - related operations, such as Retail Business, Construction, and Small Business Operation. 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: AZ489FT4878 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 4.7 build 44 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

NA

4.3 Description of Equivalent tissues

Type of Simulated Tissue

The simulated tissue used is compliant to that specified in FCC Supplement C (Edition01-01) 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 MHz	
	Head	Body
Sugar	56	46.5
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 (Agilent)	E4419B	MY403300364	1/31/2007
Power Meter (HP)	E4418B	US39251152	3/29/2007
Power Sensor (HP)	8482B	3318A06773	4/19/2007
Power Sensor (HP)	8482B	3318A06774	4/22/2007
Power Sensor (HP)	8482B	3318A07548	12/9/2006
AMP (Amplifier Research)	10WD1000	28782	CNR
Bi-Directional Coupler (NARDA)	3020A	40296	11/17/2007
Signal Generator (HP)	E4438C	MY42082269	6/23/2008
Tissue Station			
Agilent PNA-L Network Analyzer	N5230A	MY45001092	5/22/2007
Dielectric Probe Kit (HP)	85070C	US99360076	CNR
Dipole			
Speag Dipole	D450V2	1001	5/25/2008

6.0 SAR Measurement System Verification

The SAR 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 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 N&E 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 N&E 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 applicable equipment indicated in section 5.0.

Actual versus Target tissue parameters 10/3/06 – 10/6/06

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	55.4 - 55.8	0.94	0.91 -0.92
501	56.5	54.6 - 55.0	0.94	0.95 – 0.96

IEEE Head				
Frequency (MHz)	Di-electric Constant Target	Di-electric Constant Meas. (Range)	Conductivity Target S/m	Conductivity Meas. (Range) S/m
501	43.2	42.5 – 42.6	0.87	0.90 -0.91

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	2/22/06	D450V2 / SN1001	4.345 ± 0.055	4.43±10%	10/3/06 – 10/6/06 (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 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.

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 modes.

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; Table 1]

- The DUT was assessed at the center frequency of the offered antenna, using the battery PMNN4071A, the audio cable PMMN4013A, and the offered carry cases.
- The DUT was assessed using the highest test configuration from above with the other offered audio accessories.
- The DUT was assessed at across the frequency range for the offered antenna, using the highest test configuration above.

Assessments at the Body 2.5cm [Page 11; Table 1]

- Assessment using the highest applicable test configuration at the body overall from above with the back facing the phantom and antenna separated 2.5cm from phantom.
- Assessment using the highest applicable test configuration at the body overall from above with front housing of the DUT separated 2.5cm from the phantom.
- The DUT was assessed using the highest test configuration from above with the other battery.

Assessments at the Face [Page 12; Table 2]

- The DUT was assessed at across the center frequency range for the offered antenna, using the battery PMNN4071A.
- The DUT was assessed using the highest test configuration from above with the other battery.

[Shortened scan assessment at the Body] [APPENDIX E Part 2 of 2]

- 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 the back facing the phantom and antenna separated 2.5cm from phantom.
The DUT was positioned with its' front side 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 +/ - 2^{o}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 SAR tests reported herein:

	Target	Measured
Ambient Temperature	20 - 25 ˚C	Range: 22.0 - 23.7˚C Avg. 22.4˚C
Relative Humidity	30 - 70 %	Range: 48.7-59.3% Avg. 53.3%
Tissue Temperature	NA	Range: 19.2 -20.8˚C Avg. 19.8 ˚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 and band (in bold with *) were then assessed using the full DASY4™ coarse and 7x7x7 cube methodology, and they are presented in the worst case configuration table below. 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 Pos.**	**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)**
Assessments at the Body - Carry accessories search												
JsT-Ab-061003-09/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMMN4013A	4.51	-0.636	6.16	4.49	3.57	2.60
JsT-Ab-061003-10/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4741 A	PMMN4013A	4.53	-0.636	5.36	3.91	3.10	2.26
MeC-Ab-061003-11/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4742 A	PMMN4013A	4.47	-0.566	1.77	1.31	1.01	0.75
Assessments at the Body - Other cable accessories search												
MeC-Ab-061003-12/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMLN5011A	4.51	-0.724	6.59	4.79	3.89	2.83
MeC-Ab-061003-13/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMMN4008A	4.52	-0.716	6.39	4.65	3.77	2.74
MeC-Ab-061003-14/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMLN4442A	4.53	-0.724	6.69	4.89	3.95	2.89
MeC-AB-061003-15/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMLN4444A	4.51	-0.601	7.11	5.20	4.08	2.99
JsT-Ab-061004-03/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMLN4294D	4.54	-0.593	6.96	5.07	3.99	2.91
JsT-Ab-061004-04/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMLN4606A	4.52	-0.547	7.12	5.19	4.04	2.94
JsT-Ab-061004-05/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Against phantom	PMLN4743 A	PMLN4658A D	4.52	-0.613	6.88	5.01	3.96	2.88
Assessments at the Body - Frequencies search												
JsT-Ab-061004-06/ 0278GR1143	PMAE4028A	490.0250	PMNN4071A	Against phantom	PMLN4743 A	PMLN4444A	4.39	-0.560	8.29	6.02	4.83	3.51
JsT-Ab-061004-07/ 0278GR1143	PMAE4028A	511.9750	PMNN4071A	Against phantom	PMLN4743 A	PMLN4444A	4.59	-0.415	5.45	3.95	3.00	2.17
Assessments at the Body - 2.5cm; test same configuration indicated highest SAR result from Body above w/o carry accessory.												
***JsT-Ab-061004-08/ 0278GR1143**	**PMAE4028A**	**490.0250**	**PMNN4071A**	**Back - Antenna @ 2.5cm**	**None**	**PMLN4444A**	**4.37**	**-0.533**	**11.2**	**8.17**	**6.52**	**4.76**
MeC-Ab-061004-10/ 0278GR1143	PMAE4028A	490.0250	PMNN4071A	Front 2.5cm	None	PMLN4444A	4.45	-0.732	7.92	5.79	4.74	3.46
JsT-Ab-061006-02/ 0278GR1143	PMAE4028A	490.0250	PMNN4075A	Back - Antenna @ 2.5cm	None	PMLN4444A	4.30	-0.464	11.1	8.00	6.46	4.66

Table 2

Assessments at the Face												
Run Number/ SN	**Antenna Pos.**	**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)**
Assessments at the Face – Frequencies search												
MeC-Face-061004-11/ 0278GR1143	PMAE4028A	501.0250	PMNN4071A	Front 2.5cm	None	None	4.59	-0.724	8.29	6.08	4.90	3.59
***MeC-Face-061004-12/ 0278GR1143**	**PMAE4028A**	**490.0250**	**PMNN4071A**	**Front 2.5cm**	**None**	**None**	**4.45**	**-0.660**	**10.7**	**7.82**	**6.30**	**4.60**
MeC-Face-061004-13/ 0278GR1143	PMAE4028A	511.9750	PMNN4071A	Front 2.5cm	None	None	4.62	-0.551	6.43	4.71	3.65	2.67
JsT-Face-061006-07/ 0278GR1143	PMAE4028A	490.0250	PMNN4075A	Front 2.5cm	None	None	4.34	-0.486	10.7	7.76	6.20	4.50

***Worst case configuration per body location and mode from above –using the DASY 4 full coarse and 7x7x7 cube scan measurements.**												
Run Number/ SN	**Antenna Pos.**	**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)**
Assessments at the Body												
JsT-Ab-061006-03/ 0278GR1143 (Full scan)	PMAE4028A	490.0250	PMNN4071A	Back - Antenna @ 2.5cm	None	PMLN4444A	4.36	-0.746	11.4	8.25	6.99	5.06
JsT-Ab-061006-06/ 0278GR1143 (Shorten scan)	PMAE4028A	490.0250	PMNN4071A	Back - Antenna @ 2.5cm	None	PMLN4444A	4.35	-0.416	11.9	8.73	6.77	4.97
Assessments at the Face – Frequencies search												
JsT-Face-061006-08/ 0278GR1143 (Full scan)	PMAE4028A	490.0250	PMNN4071A	Front 2.5cm	None	None	4.33	-0.818	10.1	7.32	6.34	4.59

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:

Max. Calc. 1-g/10-g Avg. SAR = ((SAR 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-g/10-g Avg. 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: AZ489FT4878 models AAH84TCJ8AA1AN.

Max. Calc. : 1-g Avg. SAR: 6.99 W/kg (Body); 10-g Avg. SAR: 5.06 W/kg (Body)
Max. Calc. : 1-g Avg. SAR: 6.34 W/kg (Face); 10-g Avg. SAR: 4.59 W/kg (Face)

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

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	3.2	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)			k=2				22	22	

Uncertainty Budget for System Validation (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 Certificates

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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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_Feb06

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1383
Calibration procedure(s)	QA CAL-01.v5 and QA CAL-12.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	February 22, 2006
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	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)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: February 22, 2006

Calibration Laboratory of
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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., $\vartheta = 0$ 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 $\vartheta = 0$ ($f \leq 900$ 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 $f \leq 800$ 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 *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.

Probe ET3DV6

SN:1383

Manufactured:	August 16, 1999
Last calibrated:	February 24, 2005
Recalibrated:	February 22, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1383 February 22, 2006

DASY - Parameters of Probe: ET3DV6 SN:1383

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**1.87** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**90** mV
NormY	**1.63** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**90** mV
NormZ	**1.70** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**90** 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	9.4	5.0
SAR_{be} [%]	With Correction Algorithm	0.0	0.0

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	8.3	4.5
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm
Optical Surface Detection	**NOT in Tolerance**

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%.

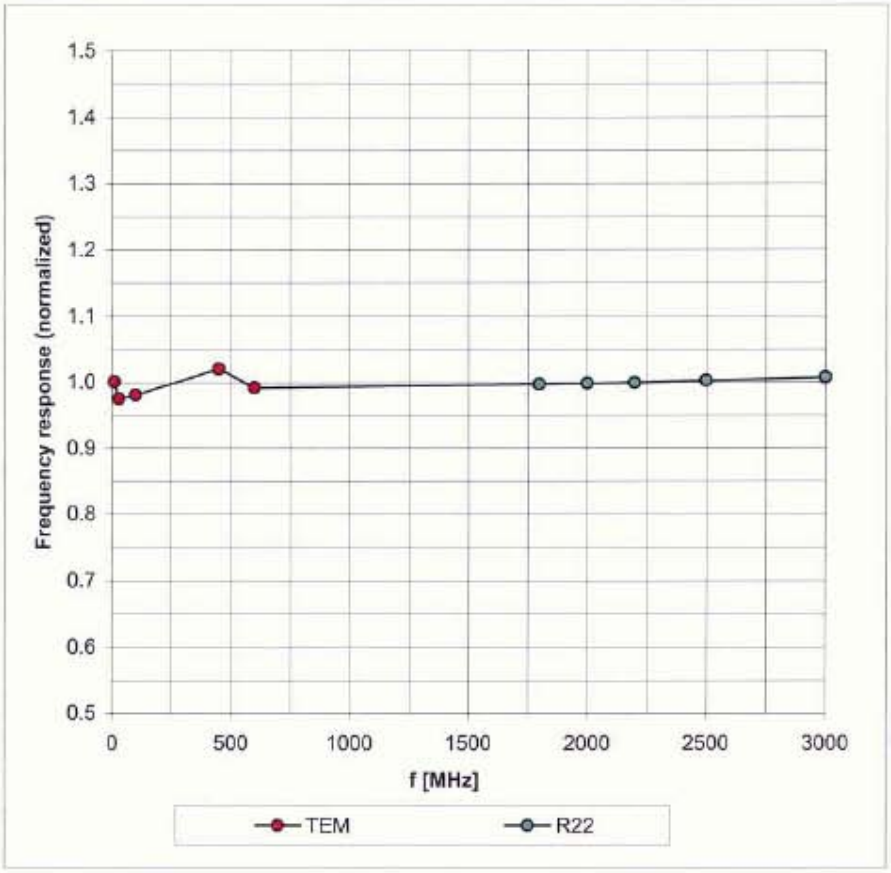
[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1383 February 22, 2006

Frequency Response of E-Field

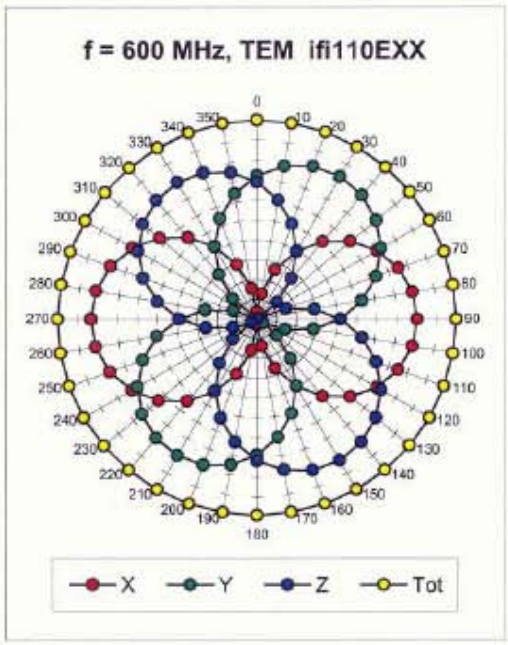
(TEM-Cell:ifi110 EXX, Waveguide: R22)

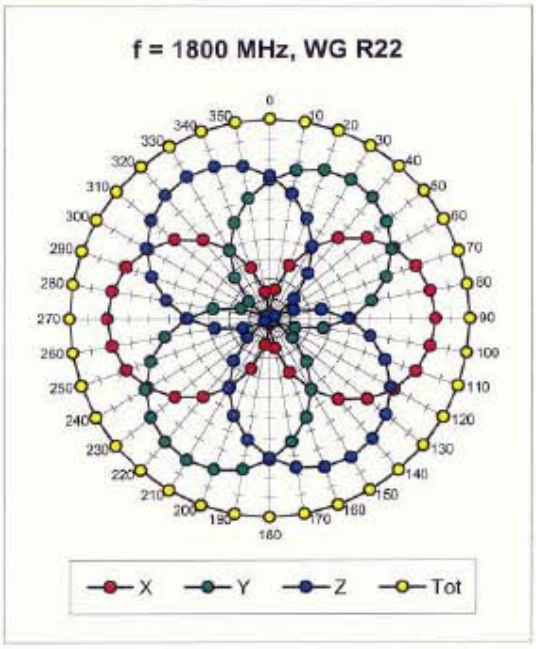


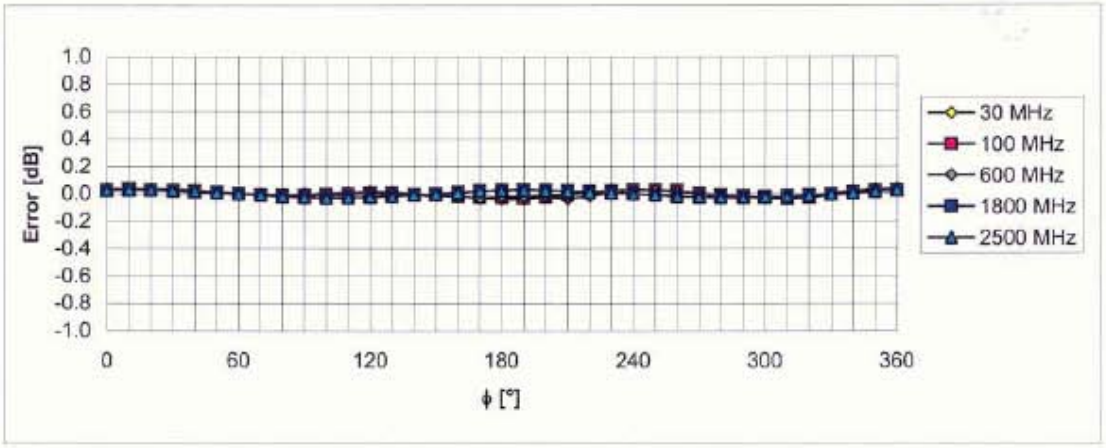
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6 SN:1383 February 22, 2006

Receiving Pattern (ϕ), ϑ = 0°





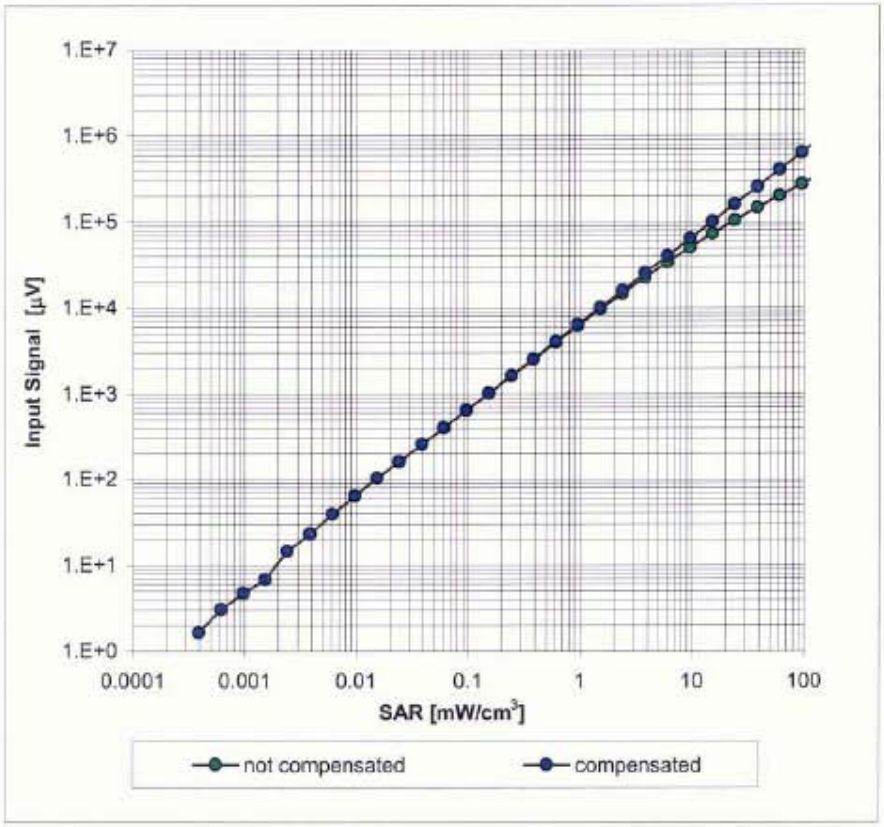


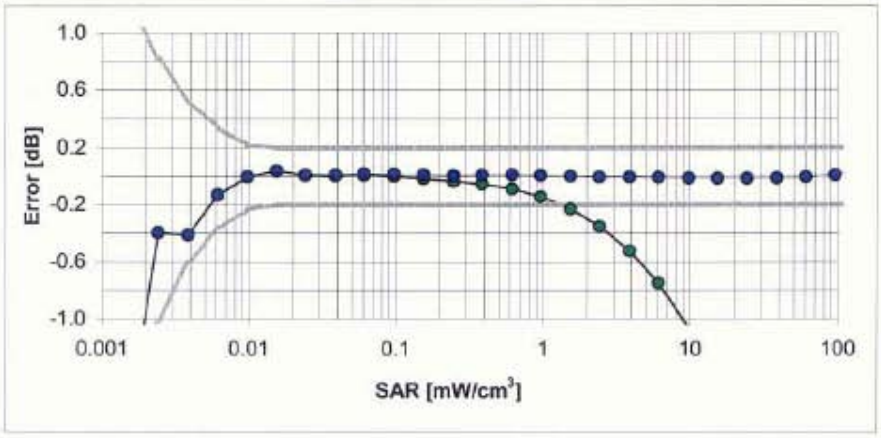
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ET3DV6 SN:1383 February 22, 2006

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

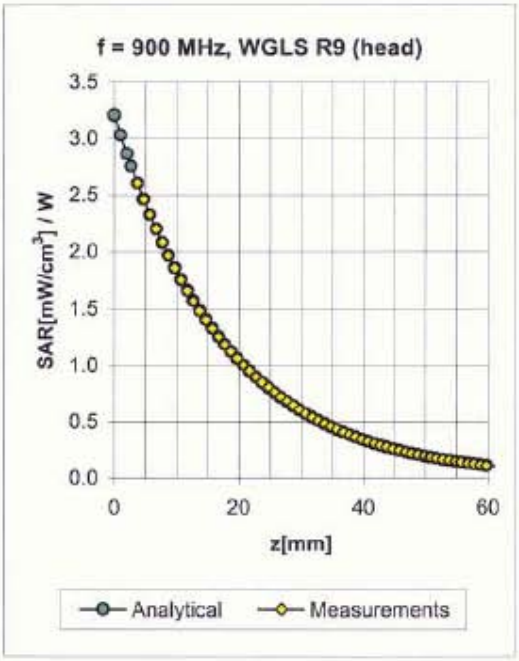


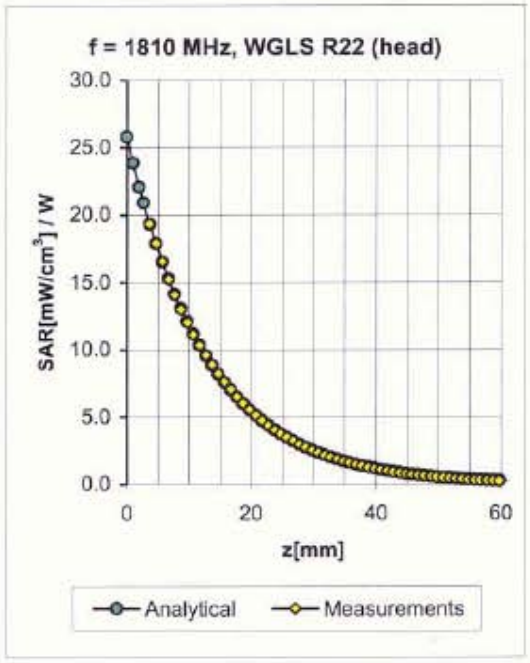


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1383 February 22, 2006

Conversion Factor Assessment





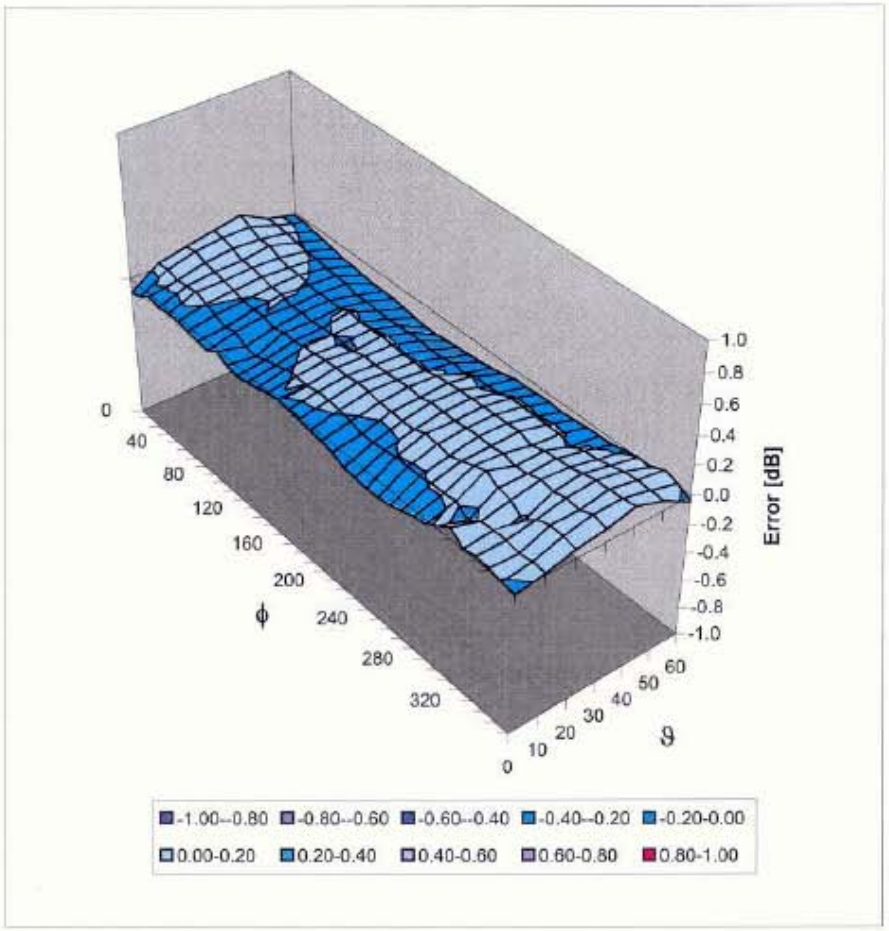
f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.30	2.95	6.74 ± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.74	1.72	6.21 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.77	1.59	5.13 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	1.12	1.16	4.56 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.27	3.94	7.12 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.62	1.94	5.89 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.88	1.77	4.66 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	1.29	1.16	4.29 ± 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 22, 2006

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1383**
Place of Assessment:	**Zurich**
Date of Assessment:	**February 23, 2006**
Probe Calibration Date:	**February 22, 2006**

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 1810 MHz.

Assessed by:

Schmid & Partner Engineering AG

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s p e a g

Dosimetric E-Field Probe ET3DV6 SN:1383

Conversion factor (± standard deviation)

150 MHz	*ConvF*	**8.4 ± 10%**	ε_r = 52.3 σ = 0.76 mho/m (head tissue)
250 MHz	*ConvF*	**7.7 ± 10%**	ε_r = 47.6 σ = 0.83 mho/m (head tissue)
300 MHz	*ConvF*	**7.6 ± 9%**	ε_r = 45.3 σ = 0.87 mho/m (head tissue)
750 MHz	*ConvF*	**6.5 ± 7%**	ε_r = 41.9 σ = 0.89 mho/m (head tissue)
150 MHz	*ConvF*	**8.2 ± 10%**	ε_r = 61.9 σ = 0.80 mho/m (body tissue)
250 MHz	*ConvF*	**7.7 ± 10%**	ε_r = 59.4 σ = 0.88 mho/m (body tissue)
300 MHz	*ConvF*	**7.6 ± 9%**	ε_r = 58.2 σ = 0.92 mho/m (body tissue)
750 MHz	*ConvF*	**6.3 ± 7%**	ε_r = 55.5 σ = 0.96 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 Calibration Certificates

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

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Accreditation No.: **SCS 108**

Client **Motorola CGISS** Certificate No: **D450V2-1001_May06**

CALIBRATION CERTIFICATE

Object	D450V2 - SN: 1001
Calibration procedure(s)	QA CAL-15.v4 Calibration Procedure for dipole validation kits below 800 MHz
Calibration date:	May 25, 2006
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-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference Probe ET3DV6	SN 1507	11-Jul-05 (SPEAG, No. ET3-1507_Jul05)	Jul-06
DAE4	SN 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

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

Issued: May 25, 2006

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

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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
ConF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.6
Extrapolation	Advanced Extrapolation	
Phantom	Flat Phantom V4.4	Shell thickness: 6 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	43.5	0.87 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	43.6 ± 6 %	0.86 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	398 mW input power	2.00 mW / g
SAR normalized	normalized to 1W	5.03 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**5.06 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	398 mW input power	1.35 mW / g
SAR normalized	normalized to 1W	3.39 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**3.40 mW / g ± 17.6 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.0 Ω - 9.6 jΩ
Return Loss	- 20.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.343 ns

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

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.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 22, 2002

DASY4 Validation Report for Head TSL

Date/Time: 25.05.2006 13:20:31

Test Laboratory: SPEAG, Zurich, Switzerland

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

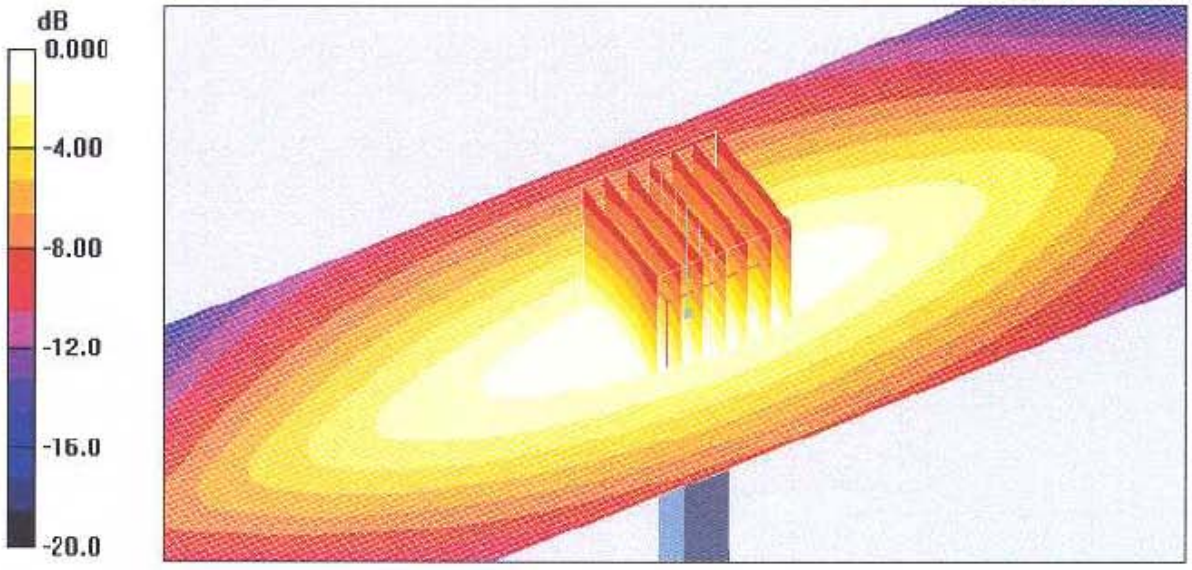
Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450;
Medium parameters used: f = 450 MHz; σ = 0.86 mho/m; ε_r = 43.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF (6.59, 6.59, 6.59); Calibrated: 11.07.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.4; Type: Flat Phantom 4.4
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

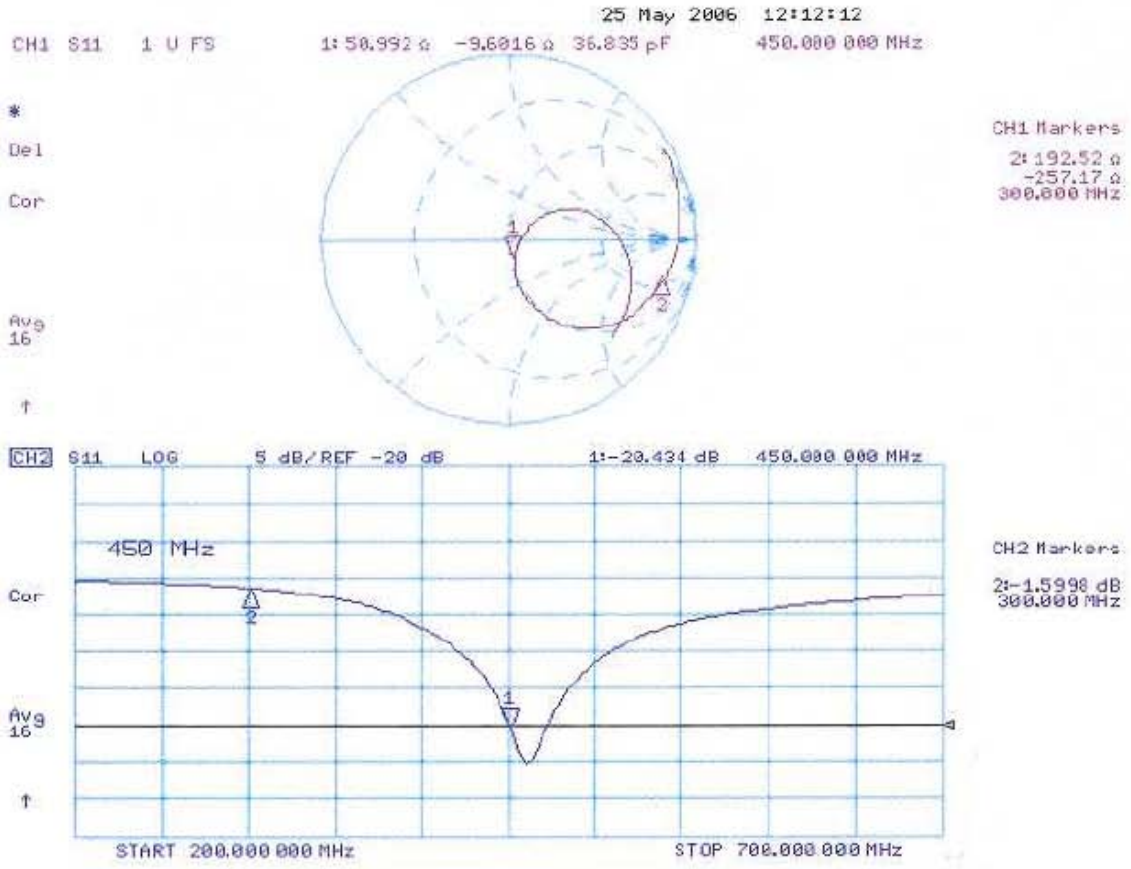
d=15mm, Pin=398mW/Area Scan (61x201x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.14 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.1 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 2.85 W/kg
SAR(1 g) = 2 mW/g; SAR(10 g) = 1.35 mW/g
Maximum value of SAR (measured) = 2.14 mW/g



0 dB = 2.14mW/g

Impedance Measurement Plot for Head TSL



Appendix D
Test System Verification Scans

Dipole validation scans at the head from SPEAG are provided in APPENDIX C. NE's EME lab validates its' dipole(s) to the applicable IEEE system performance targets. A system validation was performed using FCC body tissue parameters to generate the system performance target values for body at the applicable frequency. Dipoles are assessed using multiple probes and measurements were performed using the isotropic assessment procedure mentioned below.
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.
The results obtained from each probe were then averaged together to determine the new measured SAR target.

Motorola N&E EME Laboratory
Test Date: 10/03/06
Run #: JsT-SYSP-450B-061003-01
Sim.Tissue Temp: 19.8 (C)
Model #: D450V2 S/N: 1001
TX Freq: 450 (MHz) Start power: 250 (mW)

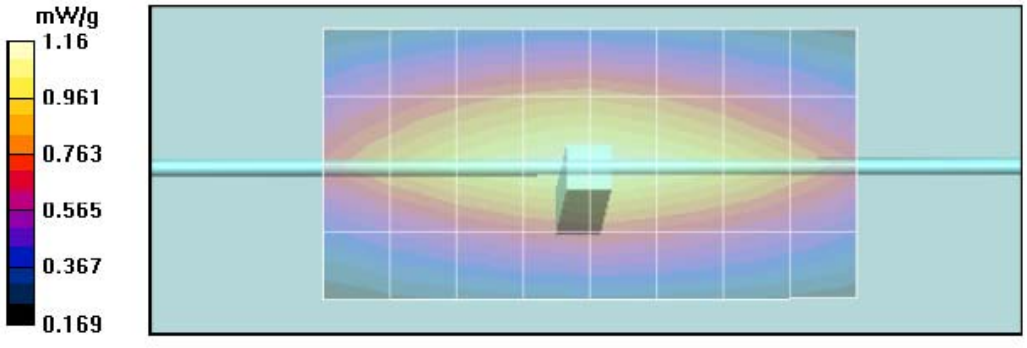
Target:4.43 mW/g for 1g SAR 2.96 mW/g for 10g SAR
4.29 mW/g calculated 1g-SAR; -3.19% from target (including drift)
2.91 mW/g calculated 10g-SAR; -1.75% from target (including drift)

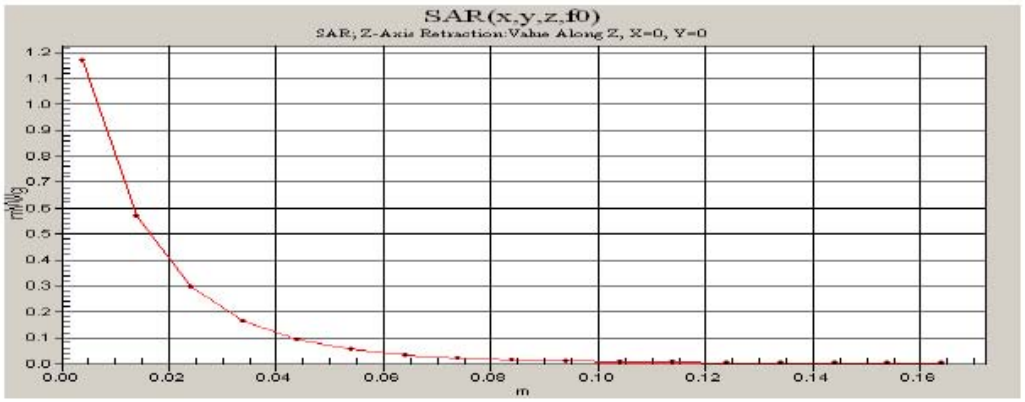
Probe: ET3DV6 - SN1383, Calibrated: 2/22/2006, ConvF(7.12, 7.12, 7.12)
Duty Cycle: 1:1, Medium: 450 MHz FCC Body, Medium parameters used: f = 450 MHz; σ = 0.91 mho/m; ε_r = 55.8; ρ =1000 kg/m3; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

System Performance/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm,dy=7.5mm, dz=5mm
Reference Value = 37.5 V/m; Power Drift = 0.0115 dB
Peak SAR (extrapolated) = 1.55 W/kg
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.732 mW/g
Maximum value of SAR (measured) = 1.17 mW/g

System Performance/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm,dy=7.5mm, dz=5mm
Reference Value = 37.5 V/m; Power Drift = 0.0115 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.725 mW/g
Maximum value of SAR (measured) = 1.15 mW/g

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





Motorola N&E EME Laboratory
Test Date: 10/04/06
Run #: JsT-SYSP-450B-061004-01
Sim.Tissue Temp: 20.3 (C)
Model #: D450V2 S/N: 1001
TX Freq: 450 (MHz) Start power: 250 (mW)

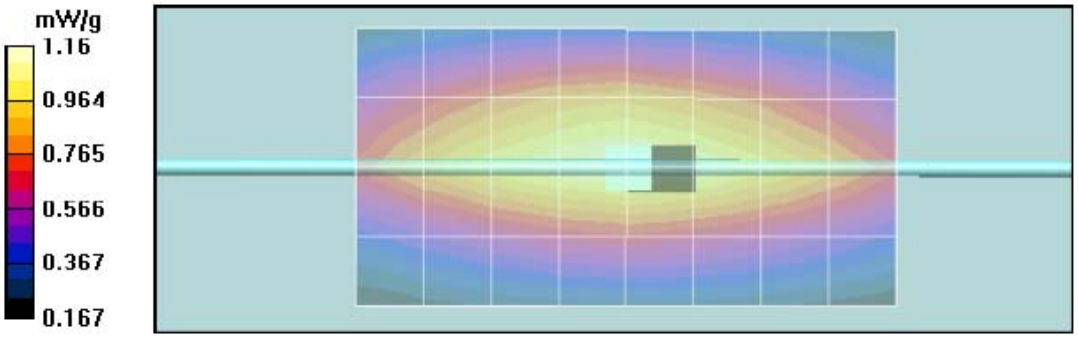
Target: 4.43 mW/g for 1g SAR 2.96 mW/g for 10g SAR
4.40 mW/g calculated 1g-SAR; -0.58% from target (including drift)
3.00 mW/g calculated 10g-SAR; 1.18% from target (including drift)

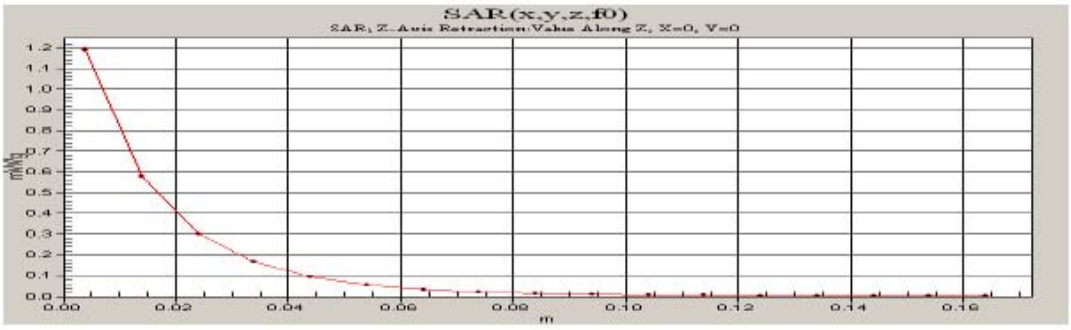
Probe: ET3DV6 - SN1383, Calibrated: 2/22/2006, ConvF(7.12, 7.12, 7.12)
Duty Cycle: 1:1, Medium: 450 MHz FCC Body, Medium parameters used: f = 450 MHz; σ = 0.92 mho/m; εr = 55.5; ρ =1000 kg/m3; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

System Performance/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm,dy=7.5mm, dz=5mm
Reference Value = 37.6 V/m; Power Drift = -0.00445 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 1.1 mW/g; SAR(10 g) = 0.749 mW/g
Maximum value of SAR (measured) = 1.19 mW/g

System Performance/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 37.6 V/m; Power Drift = -0.00445 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 1.1 mW/g; SAR(10 g) = 0.747 mW/g

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





Motorola N&E EME Laboratory
Test Date: 10/06/06
Run #: JsT-SYSP-450B-061006-01
Sim.Tissue Temp: 19.3 (C)
Model #: D450V2 S/N: 1001
TX Freq: 450 (MHz) Start power: 250 (mW)

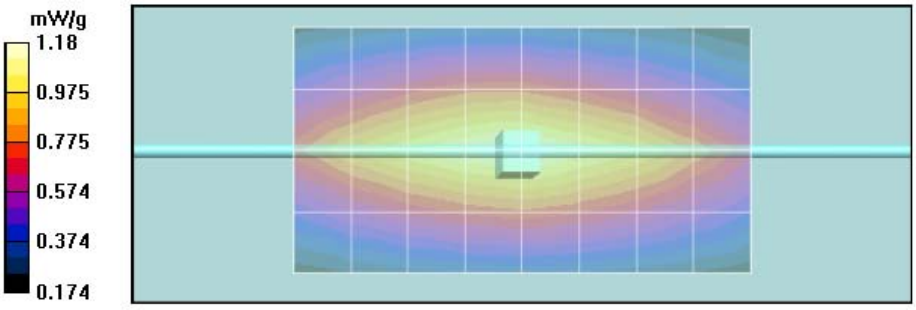
Target:4.43 mW/g for 1g SAR 2.96 mW/g for 10g SAR
4.36 mW/g calculated 1g-SAR; -1.54% from target (including drift)
2.95 mW/g calculated 10g-SAR; -0.31% from target (including drift)

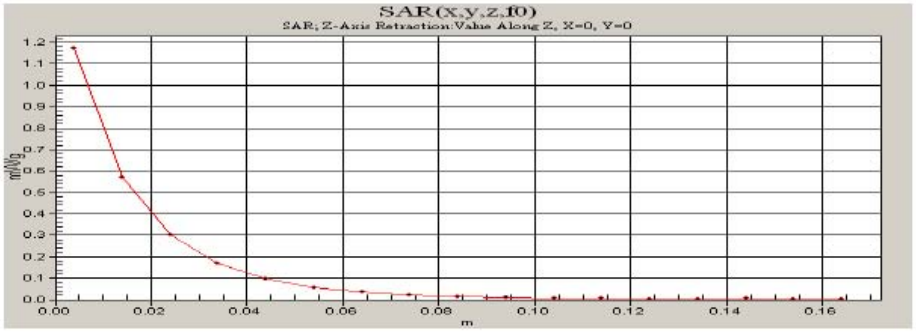
Probe: ET3DV6 - SN1383, Calibrated: 2/22/2006, ConvF(7.12, 7.12, 7.12)
Duty Cycle: 1:1, Medium: 450 MHz FCC Body, Medium parameters used: f = 450 MHz; σ = 0.91 mho/m; εr = 55.4; ρ =1000 kg/m3; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

System Performance/0-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm,dy=7.5mm, dz=5mm
Reference Value = 37.7 V/m; Power Drift = -0.0217 dB
Peak SAR (extrapolated) = 1.55 W/kg
SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.737 mW/g
Maximum value of SAR (measured) = 1.17 mW/g

System Performance/90-Degree 5x5x7 Cube (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 37.7 V/m; Power Drift = -0.0217 dB
Peak SAR (extrapolated) = 1.53 W/kg
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.730 mW/g
Maximum value of SAR (measured) = 1.16 mW/g

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





DIPOLE SAR TARGET - HEAD

Date:	06/17/06	Frequency (MHz):	450
Lab Location:	NE	Mixture Type:	IEEE Head
DAE Serial #:	363	Ambient Temp.(°C):	22.6

Tissue Characteristics			
Permitivity:	45.2	Phantom Type/SN:	80302002B-S8
Conductivity:	0.91	Distance (mm):	15
Tissue Temp.(°C):	21.9		

Reference Source:	Dipole	Power to Dipole:	250 mW
Reference SN:	1001		

Target SAR Value: **4.9** mW/g (1g avg.), **3.3** mW/g (10g avg.)
(normalized to 1.0 W)

New Target:

Average Measured SAR Value: **5.11** mW/g (1g avg.), **3.34** mW/g (10g avg.)

Percent Difference From Target (MUST be within k=2 Uncertainty): **4.33%** (1g ave) **1.33%** (10g ave)

Test performed by: **Ed Church** Initial: E, C

Probe SN #s	1-G Cube	Diff from Ave	10-G Cube	Diff from Ave	Robot
1383	5.02	-1.80%	3.33	-0.42%	R3
1384	4.89	-4.34%	3.20	-4.31%	R3
1393	4.77	-6.69%	3.18	-4.90%	R3
1545	5.37	5.05%	3.46	3.47%	R3
1547	5.51	7.79%	3.55	6.16%	R3
Average	5.1120		3.3440	New Measured SAR Value	
			(normalized to 1.0 W, including drift)		

DIPOLE SAR TARGET - BODY

Date:	06/17/06	Frequency (MHz):	450
Lab Location:	NE	Mixture Type:	FCC Body
DAE Serial #:		Ambient Temp.(°C):	22.7

Tissue Characteristics

Permitivity:	56.5	Phantom Type/SN:	80302002C-S9
Conductivity:	0.92	Distance (mm):	15
Tissue Temp.(°C):	21.4		

Reference Source:	Dipole	Power to Dipole:	250 mW
Reference SN:	1001		

New Target:

Average Measured SAR Value: **4.43** mW/g(1g avg.), **2.96** mW/g (10g avg.)

Test performed by: **Ed Church** Initial: E, C

Probe SN #s	1-G Cube	Diff from Ave	10-G Cube	Diff from Ave	Robot
1383	4.22	-4.7%	2.87	-3.1%	R3
1384	4.23	-4.5%	2.89	-2.4%	R3
193	4.09	-7.7%	2.81	-5.1%	R3
1545	4.79	8.1%	3.11	5.0%	R3
1547	4.82	8.8%	3.13	5.7%	R3
Average	**4.4300**		**2.9620**	**New Measured SAR Value**	
(nomalized to 1.0 W, including drift)					

Appendix E
DUT Scans (Shortened Scans and Highest SAR configurations)

Shortened Scan Results

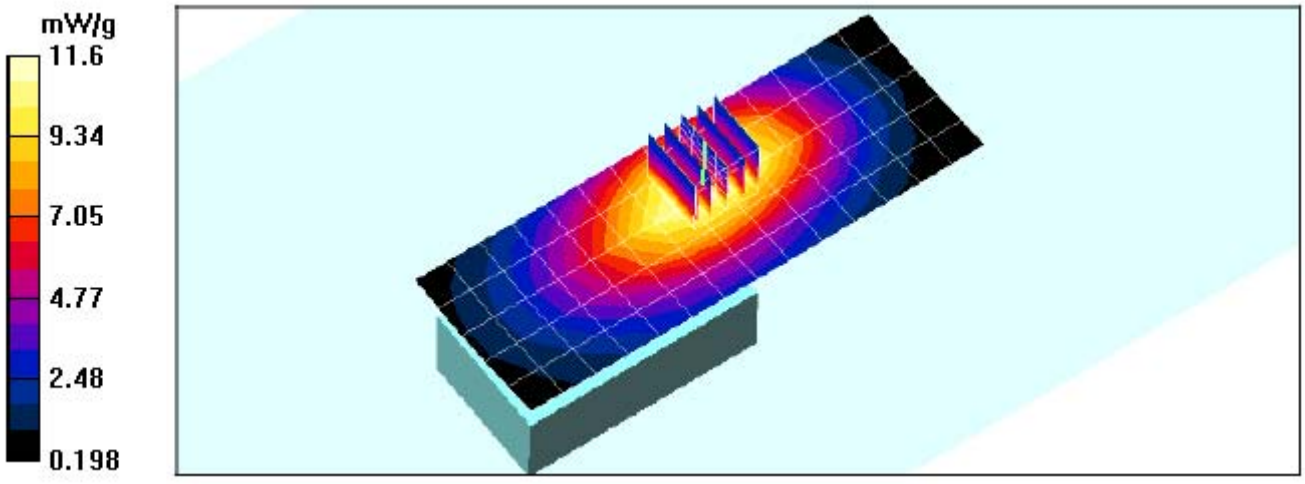
Motorola N&E EME Laboratory
Test Date: 10/06/06
Run #: JsT-Ab-061006-06
Sim. Tissue Temp: 19.6 (C)

Model #: AAH84TCJ8AA1AN	SN: 0278GR1143
Antenna: PMAE4028A	TX Freq: 490.0250 MHz
Battery: PMNN4071A	Start power: 4.35 W
Carry acc.: None	Audio/Data acc.: PMLN4444A

Comments: Short Scan Body - Back of DUT facing phantom with antenna @ 2.5cmwithout carry accessory
Shortened scan reflect highest S.A.R. producing configuration; Run time 7 minutes.
Representative "normal" scan run time was 22 minutes
"Shortened" scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 6.77 mW/g; 10-g Avg. = 4.97 mW/g
"Normal" scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 6.99 mW/g; 10-g Avg. = 5.06 mW/g
(see part 1 of 2 section 9.0 run # JsT-Ab-061006-03)

Probe: ET3DV6 - SN1383, Calibrated: 2/22/2006, ConvF(7.12, 7.12, 7.12)
Duty Cycle: 1:1, Medium: 501 MHz FCC Body, Medium parameters used: f = 501 MHz; σ = 0.95 mho/m; εr = 54.6; ρ = 1000 kg/m3; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

Ab Template/5x5x7 Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 124.7 V/m; Power Drift = -0.416 dB
Peak SAR (extrapolated) = 15.4 W/kg
SAR(1 g) = 11.9 mW/g; SAR(10 g) = 8.73 mW/g
Maximum value of SAR (measured) = 12.7 mW/g



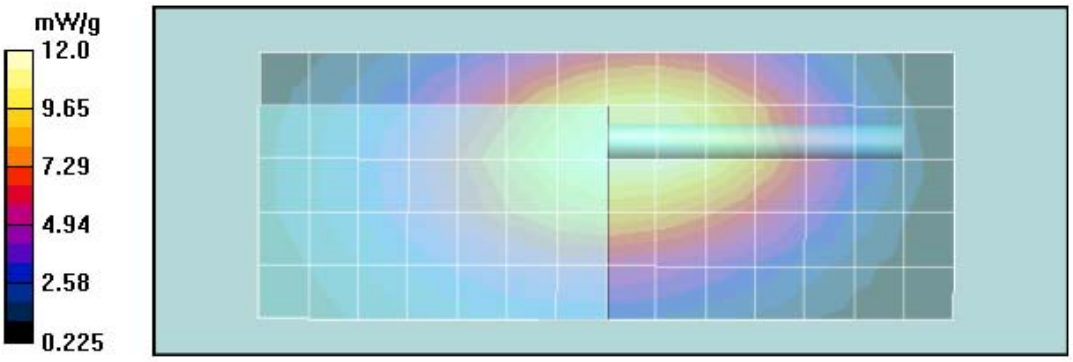
Motorola N&E EME Laboratory
Test Date: 10/06/06
Run #: JsT-Ab-061006-03
Sim. Tissue Temp: 19.5 (C)
Model #: AAH84TCJ8AA1AN SN: 0278GR1143
Antenna: PMAE4028A TX Freq: 490.0250 MHz
Battery: PMNN4071A Start power: 4.36 W
Carry acc.: None Audio/Data acc.: PMLN4444A
Comments: Back of DUT facing phantom with antenna @ 2.5cm.

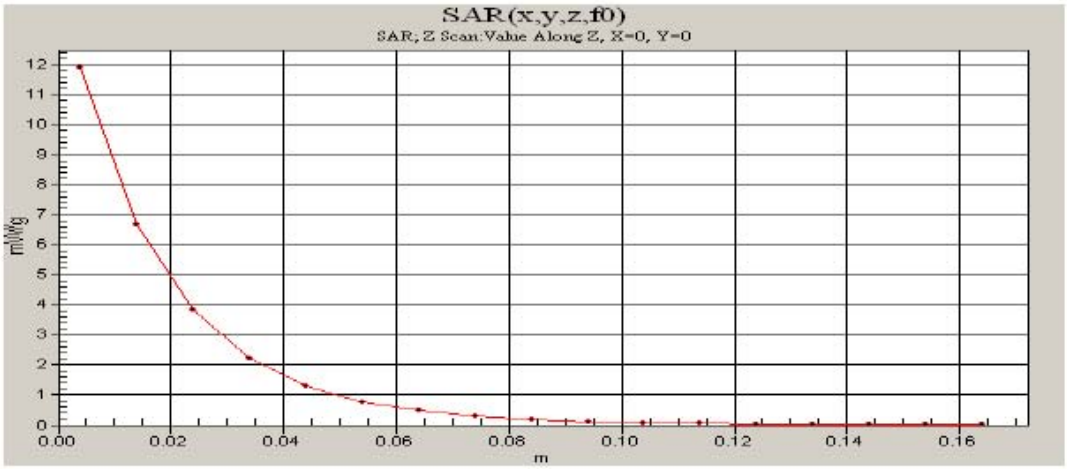
Probe: ET3DV6 - SN1383, Calibrated: 2/22/2006, ConvF(7.12, 7.12, 7.12)
Duty Cycle: 1:1, Medium: 501 MHz FCC Body, Medium parameters used: f = 501 MHz; σ = 0.95 mho/m; εr = 54.6; ρ = 1000 kg/m3; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

Ab Template/7x7x7 Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 127.2 V/m; Power Drift = -0.746 dB
Peak SAR (extrapolated) = 14.9 W/kg
SAR(1 g) = 11.4 mW/g; SAR(10 g) = 8.25 mW/g
Maximum value of SAR (measured) = 12.0 mW/g

Ab Template/Area Scan (51x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 12.3 mW/g

Ab Template/Z Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm
Maximum value of SAR (measured) = 11.9 mW/g





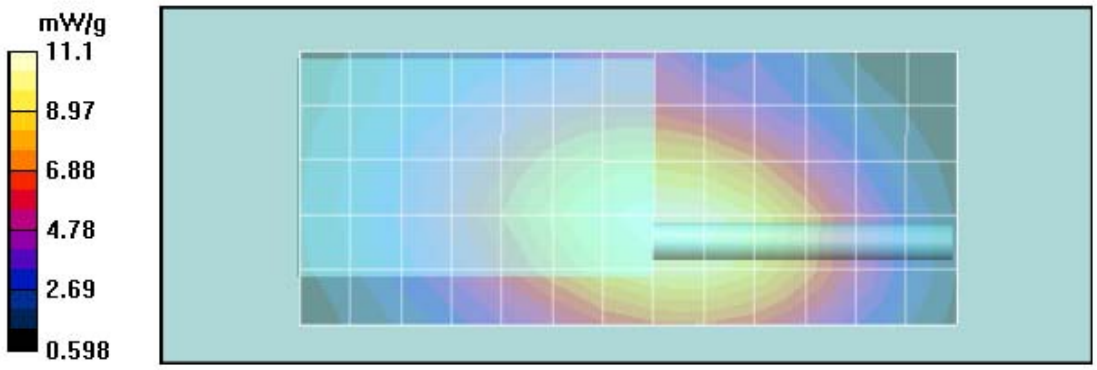
Motorola N&E EME Laboratory
Test Date: 10/06/06
Run #: JsT-Face-061006-08
Sim. Tissue Temp: 20.4 (C)
Model #: AAH84TCJ8AA1AN SN: 0278GR1143
Antenna: PMAE4028A TX Freq: 490.0250 MHz
Battery: PMNN4071A Start power: 4.33 W
Carry acc.: None Audio/Data acc.: None
Comments: Front of DUT @ 2.5cm.

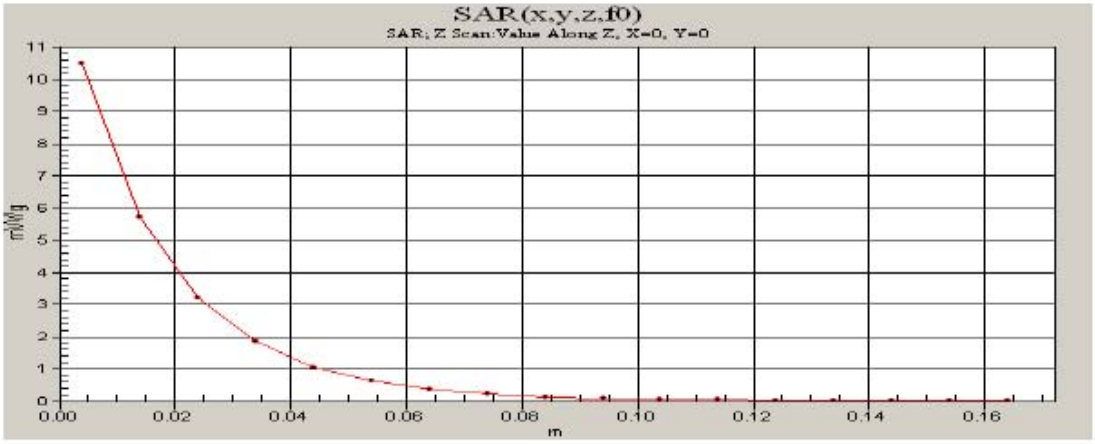
Probe: ET3DV6 - SN1383, Calibrated: 2/22/2006, ConvF(6.74, 6.74, 6.74)
Duty Cycle: 1:1, Medium: 501 MHz IEEE Head , Medium parameters used: f = 501 MHz; σ = 0.91 mho/m; εr = 42.6; ρ = 1000 kg/m3; Electronics: DAE3 Sn406, Calibrated: 11/21/2005

Face Template/7x7x7 Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 119.8 V/m; Power Drift = -0.818 dB
Peak SAR (extrapolated) = 13.8 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 7.32 mW/g
Maximum value of SAR (measured) = 10.7 mW/g

Face Template/Area Scan (51x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.2 mW/g

Face Template/Z Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm
Maximum value of SAR (measured) = 10.5 mW/g





APPENDIX F
DUT Supplementary Data (Power slump)

Model # AAH84TCJ8AA1AN
Serial # 0278GR1143

Battery	PMNN4071A	**Transmit Mode**	CW
Frequency	490.025 MHz	**Audio Accessory**	PMMN4008A
Date	10/10/2006		

TX TIME (minutes)	**Measured Power** Watts
0.0	4.28
1.0	4.24
2.0	4.21
3.0	4.20
4.0	4.20
5.0	4.19
6.0	4.18
7.0	4.18
8.0	4.18
9.0	4.18
10.0	4.17
11.0	4.17
12.0	4.16
13.0	4.16
14.0	4.15
15.0	4.15
16.0	4.15
17.0	4.14
18.0	4.14
19.0	4.13
20.0	4.13
21.0	4.12
22.0	4.12
23.0	4.12
24.0	4.11
25.0	4.11
26.0	4.11
27.0	4.11
28.0	4.10
29.0	4.10
30.0	4.09
31.0	4.09
32.0	4.09
33.0	4.09
34.0	4.08
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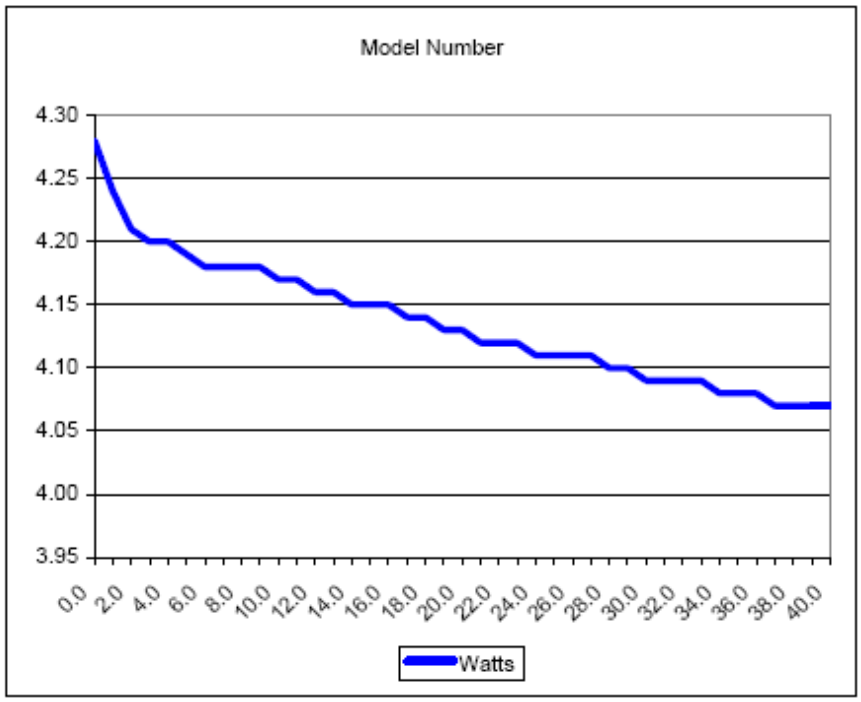
36.0	4.08
37.0	4.07
38.0	4.07
39.0	4.07
40.0	4.07



Appendix G
DUT Test Position Photos

Figure 1: Highest S.A.R. Test Position (Body)
DUT Back w/ antenna separated 2.5cm from the phantom.
Worst case audio acc. Model PMLN4444A attached

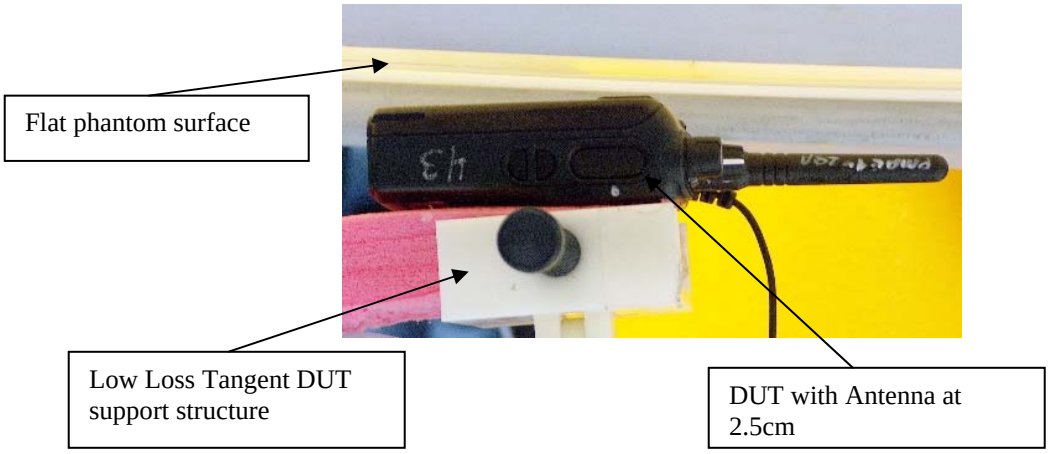


Figure 2: Highest S.A.R. Test Position (face)
DUT w/ front side separated 2.5cm from the phantom
No audio cable attached

Figure 3: Body Assessment
DUT w/ belt clip PMLN4743A against the phantom.
Worst case audio acc. Model PMLN4444A attached
(Same test position for other audio accessories)

Figure 4: Body Assessment
DUT w/ belt clip PMLN4741A against the phantom.
With audio acc. Model PMMN4013A attached

Figure 5: Body Assessment
DUT w/ belt clip PMLN4742A against the phantom.
With audio acc. Model PMMN4013A attached

Appendix H
DUT and Body worn Accessory Photos

Photo 1.
Model PMLN4741A
Back View

Photo 2.
Model PMLN4741A
Side View

Photo 3.
Model PMLN4741A
Front View

Photo 4.
Model PMLN4742A
Back View

Photo 5.
Model PMLN4742A
Side View

Photo 6.
Model PMLN4742A
Front View

Photo 7.
Model PMLN4743A
Back View

Photo 8.
Model PMLN4743A
Side View

Appendix I

DUT Antenna Separation Distances and Offered Accessory Test Status

The following table(s) summarizes the separation distances and test status 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
PMLN4741A	Yes	35-49	NA
PMLN4742A	Yes	64-95	NA
PMLN4743A	Yes	29-45	NA

Audio Acc. Models	Tested ?	Separation distances between DUT antenna and phantom surface. (mm)	Comments
PMMN4013A	Yes	NA	
PMLN5011A	Yes	NA	
PMMN4008A	Yes	NA	
PMLN4442A	Yes	NA	
PMLN4443A	No	NA	B/S to PMLN4442A
PMLN4444A	Yes	NA	
PMLN4445A	No	NA	B/S to PMLN4444A
PMLN4294D	Yes	NA	
PMLN4606A	Yes	NA	
PMLN4605A	No	NA	replacement part
PMLN4658A	Yes	NA	