

 MOTOROLA	 ACCREDITED TESTING CERT # 2518.01
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FCC ID: AZ489FT4882
DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

Government & Public Safety EME Test Laboratory 8000 West Sunrise Blvd Fort Lauderdale, FL. 33322	Date of Report: 10/26/07 Report Revision: 0 Report ID: SAR report PMUE3031A_RevO_071026_SR5665.
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<p>Responsible Engineer: Kim Uong (Principal Staff EME Eng.) Date/s Tested: 10/12/07-10/16/07, 10/24/07 Manufacturer/Location: Motorola – China Sector/Group/Div.: RBR Date submitted for test: 10/4/07 DUT Description: RDU4160d UHF RBR, 16Ch,Display, Removable Antenna, 4.0Watts (Li-Ion), 2.0 Watts (AA) Color Black Test TX mode(s): CW Max. Power output: 4.2W (Li-Ion battery), 2.4W (AA Alkaline battery) Nominal Power: 4.0W (Li-Ion battery), 2.0W (AA Alkaline battery) Tx Frequency Bands: 438.000MHz - 470.000MHz Signaling type: FM Model(s) Tested: PMUE3031A Model(s) Certified: PMUE3031A Serial Number(s): 20 Classification: Occupational/Controlled Rule Part(s): 90</p> <p>Approved Accessories: Antenna(s): RAN4031A (1/4wave Whip, 438MHz - 470MHz, 3dBi), RAN4033A (1/4wave Stubby, 438MHz - 470MHz, 2dBi) Battery(ies): 6080384X63 (RLN6305A, 2200mAH Li-Ion); 6080384X65 (RLN6351A , 1100mAH Li-Ion); 6080384Y10 (RLN6308A, 2400mAH Li-Ion); RHN1005A (RLN6306A, AA Alkaline battery Tray). Body worn accessory(ies): 4280383X62 (RLN6307A, Spring Action Belt clip); RLN6301B (RLN6302A, Leather Carry Case) Audio/Data cable accessory(ies): HMN9026D (53862,Remote Spk Mic); HMN9025D (53866, Earbud w/PTT Mic); NTN9159F (53815, Lightweight Headset); ENMN4002B (Headset w/Boom Mic); HCSN4000D (56517, Earpiece w/ PTT Mic); HMN9039E (53863, Earpiece w/ Boom Mic); HCSN4001C (56518, Earpiece); HMN9038A (53865, Headset w/ Swivel Boom Mic); RLN5714B (Earpiece w/ Inline Mic); PMMN4001A (Earset w/ PTT Mic); PMLN4658A (D-Style Mic Earset w/ Vox); HMN9036A(Earbud w/PTT Mic); RLN5317A (Earpiece w/ PTT Mic Bge); HMN9030A (Remote Speaker Mic); HMN9013B (Lt Wt Hdst); PMLN5011A (Temple Transducer Headset); RLN5411A (Lt Wt Hdst w/ Boom Mic PTT); RMN4016B (Lt Wt Hdst w/ Swivel Boom Mic); RLN5318A (Earpiece Surveillance Mic); HMN9754D (Earpiece Surveillance Mic Bge); BDN6720A (Earpiece w/ GP300 connector); HMN9727B (Earpiece W/out Vol Control); HLN9132A (Earpiece); HMN9752B (Earpiece Bge); HMN9021A (Mid Tier Headset); RMN5047A (NFL Style Heavyduty Headset); RLN5238B (NFL Style Light Weight Headset); BDN6646C (Ear mic, GP300 PTT Adapter).</p> <p style="text-align: center;">Max. Calc. : 1-g Avg. SAR: 3.68 W/kg (Body); 10-g Avg. SAR: 2.65 W/kg (Body) Max. Calc. : 1-g Avg. SAR: 3.33 W/kg (Face); 10-g Avg. SAR: 2.43 W/kg (Face)</p>	
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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.

I attest to the accuracy of the data and assume full responsibility for the completeness of these measurements. This reporting format is consistent with the suggested 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 G&PS EME Lab Senior Resource Manager, Laboratory Director, Approval Date:	Certification Date: _____ Certification No.: _____
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Part 1 of 2

1.0 Introduction and Overview..... 3
 2.0 Referenced Standards and Guidelines 3
 2.1 SAR Limits 4
 3.0 Description of Device Under Test (DUT) 4
 4.0 Description of Test System 5
 4.1 Description of Robotics/Probes/Readout Electronics 5
 4.2 Description of Phantom(s)..... 5
 4.2.1 Flat Phantom..... 5
 4.2.2 SAM Phantom 6
 4.3 Description of Equivalent Tissues 6
 5.0 Additional Test Equipment..... 7
 6.0 SAR Measurement System Verification..... 7
 6.1 Equivalent Tissue Test results 7
 6.2 System Check Test results 8
 7.0 DUT Test Strategy and Methodology 8
 7.1 DUT Configuration(s) 8
 7.2 Device Positioning Procedures 9
 7.2.1 Body 9
 7.2.2 Head 10
 7.2.3 Face 10
 8.0 Environmental Test Conditions 10
 9.0 Test Results Summary 10
 9.1 Highest SAR results calculation methodology 15
 10.0 Conclusion..... 15

APPENDICES

A Measurement Uncertainty 16
 B Probe Calibration Certificates 19
 C Dipole Calibration Certificates..... 31

Part 2 of 2

- D Test System Verification Scans
- E DUT Scans (Shortened Scans and Highest SAR configurations)
- F DUT Supplementary Data (e.g. Power Slump)
- G DUT Test Position Photos
- H DUT and Body-worn Accessory Photos
- I DUT Antenna Separation Distances and Offered Accessory Test Status

Report Revision History

Date	Revision	Comments
10/26/07	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 G&PS EME Test Lab for the model numbers PMUE3031A, FCC ID: AZ489FT4882. 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: AZ489FT4882 is a UHF two-way radio incorporating Zero IF technology with analog FM based on the FP99 audio processing chip set.

This device will be marketed to and used in professional business environments. Intended users are explicitly informed by the user guide that a license is required and is given information on how to obtain the required applicable licenses prior to operating the device.

This device may be used while held at least 1 inch in front of the face in PTT mode, and against the body via the offered body worn and audio accessories.

FCC ID: AZ489FT4882 is capable of operating in the 438.000MHz - 470.000MHz band. The rated conducted power is 4.0 watts for Li-Ion battery and 2.0 watts for the AA Alkaline battery. The maximum conducted output power is 4.2 watts for Li-Ion battery and 2.4 watts for the AA Alkaline battery as defined by the upper limit of the production line final test station.

FCC ID: AZ489FT4882 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 53 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	Material Thickness (mm)	Support structure material	Loss Tangent (wood)
ELI4	Rel. Permittivity = 4 ± 1 ; Loss Tangent = <0.05	2.0 ± 0.2 mm	Wood	< 0.05

4.2.2 SAM Phantom

Phantom Type	Material Parameters	Material Thickness (mm)	Support structure material	Loss Tangent (wood)
Not Applicable	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 similar type 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	450MHz	
	Head	Body
Sugar	56.0	46.5
DGBE (Glycol)	NA	NA
Diacetin	NA	NA
De ionized -Water	39.10	50.53
Salt	3.80	1.87
HEC	1.0	1.0
Bact.	0.1	0.1

5.0 Additional Test Equipment:

Equipment Type	Model Number	Serial Number	Calibration Due Date
Power Meter (Agilent)	E4419B	MY40330364	6/25/2008
E-Series Avg. Power Sensor (Agilent)	E9301B	MY41495593	2/16/2008
E-Series Avg. Power Sensor (Agilent)	E9301B	MY41495594	2/16/2008
Bi-Directional Coupler (NARDA)	3020A	40295	6/6/2008
Signal Generator (Agilent)	E4438C	MY42082269	6/23/2008
AMP (Amplifier Research)	10WD1000	28782	CNR
Tissue Station			
Agilent PNA-L Network Analyzer	N5230A	MY45001092	5/22/2008
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/SN1545. 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 G&PS 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 G&PS 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.

**Target versus Actual tissue parameters
(10/12/07 – 10/16/07, 10/24/07; 4 test days)**

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	56.0 – 56.9	0.94	0.91 – 0.93
454	56.7	55.9 – 56.2	0.94	0.91 – 0.93

IEEE Head				
Frequency (MHz)	Di-electric Constant Target	Di-electric Constant Meas. (Range)	Conductivity Target S/m	Conductivity Meas. (Range) S/m
454	43.5	43.6 - 44.7	0.87	0.86 - 0.87

6.2 System Check Test Results

Probe Serial #	Tissue Type	Probe Cal Date	Dipole Kit / Serial #	System Perf. Result when normalized to 1W (mW/g)	Reference SAR @ 1W (mW/g)	Test Date(s)
1545	FCC Body	8/28/07	SPEAG D450V2 /1001	4.245 +/-0.045	4.44 +/- 10%	10/12/07-10/16/07, 10/24/07 (4 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 two-way 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 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 5x5x7 cube scans.

Assessments at the Body [Pages 11-13 of 37; Table 1]

- Assessment at the center of the band with battery kit # 6080384X63, audio accessory kit # HMN9026D, and the belt clip 4280383X62 along with the offered antennas.
- Assessment of the other offered batteries using the highest test configuration from above.
- Assessment of the other offered carry case using the highest test configuration from above.
- Assessment of the other offered audio accessories using the highest test configuration from above.
- Band edges assessment for each of the offered antennas using the highest test configuration from above.
- Assessment of 2.5cm separation distance without carry accessory using the highest test configuration from above for each of the offered antennas.

Assessments at the Face [Page 14 of 37; Table 2]

- Assessment at the center of the band without the audio accessory and with battery kit # 6080384X63, along with the offered antennas.
- Assessment of the other offered batteries using the highest test configuration from above.
- Assessment of the offered applicable audio accessories using the highest test configuration from above.
- Band edges assessment for each of the offered antennas using the highest test configuration from above.

Shortened scan assessment [Page 15 of 37; Table 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' back towards the phantom and antenna separated 2.5cm from the phantom as well as with the front sides 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°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: 21.1 – 23.2°C Avg. 21.8°C
Relative Humidity	30 - 70 %	Range: 51.2-70.2% Avg. 58.2%
Tissue Temperature	NA	Range: 19.4-21.5°C Avg. 20.5°C

The EME Lab RF environment uses a Spectrum Analyzer to monitor for extraneous large signal RF contaminants that could possibly affect the test results. If such unwanted signals are discovered the SAR 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 per band (in bold with *). The worst case test configurations observed for each body location were assessed using the full DASY4™ coarse and 5x5x7 cube methodology and they are summarized in the worst case 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.

Table 1

Assessments at the Body 438 - 470 MHz band												
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)
Antennas Assessment at the Body												
JsT-Ab-071012-06/20	RAN4031A	454.0000	6080384X63	Against the phantom	4280383X62	HMN9026D	4.09	-0.182	3.32	2.46	1.78	1.32
JsT-Ab-071012-08/20	RAN4033A	454.0000	6080384X63	Against the phantom	4280383X62	HMN9026D	4.14	-0.243	3.50	2.58	1.88	1.38
Other Batteries Assessment at the Body												
JsT-Ab-071012-09/20	RAN4033A	454.0000	6080384X65	Against the phantom	4280383X62	HMN9026D	4.11	-0.102	3.04	2.22	1.59	1.16
JsT-Ab-071012-10/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9026D	4.09	-0.246	3.66	2.68	1.99	1.46
MeC-Ab-071024-07/20	RAN4033A	454.0000	RHN1005A w/ AA Alkaline battery	Against the phantom	4280383X62	HMN9026D	2.02	-0.463	1.29	0.95	0.72	0.53
Other carry case Assessment at the Body												
MeC-Ab-071012-11/20	RAN4033A	454.0000	6080384Y10	Against the phantom	RLN6301B	HMN9026D	4.07	-0.268	1.36	1.00	0.75	0.55
Other Audio Accessories Assessment at the Body												
MeC-Ab-071012-12/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HCSN4000D	4.10	-0.252	3.76	2.77	2.04	1.50
MeC-Ab-071012-13/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9025D	4.12	-0.304	3.67	2.70	2.01	1.48
MeC-Ab-071012-14/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	NTN9159F	4.13	-0.253	3.39	2.50	1.83	1.35
MeC-Ab-071012-15/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	ENMN4002B	4.17	-0.265	3.74	2.75	2.00	1.47
MeC-Ab-071012-16/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9039E	4.15	-0.238	3.40	2.51	1.82	1.34
MeC-Ab-071012-17/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HCSN4001C	4.14	-0.243	3.50	2.58	1.88	1.38
MeC-Ab-071012-18/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9038A	4.06	-0.271	3.62	2.67	1.99	1.47
MeC-Ab-071012-19/20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	RLN5714B	4.12	-0.202	3.19	2.34	1.70	1.25

Table 1 (continue)

Assessments at the Body 438 - 470 MHz band												
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)
Other Audio Accessories Assessment at the Body (continue)												
MeC-Ab-071012- 20/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	PMMN4001A	4.09	-0.221	3.12	2.30	1.69	1.24
JsT-Ab-071015- 02/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	PMLN4658A	4.03	-0.217	3.45	2.54	1.89	1.39
JsT-Ab-071015- 03/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9036A	4.07	-0.284	3.58	2.62	1.97	1.44
JsT-Ab-071015- 04/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9030A	4.10	-0.272	3.45	2.53	1.88	1.38
JsT-Ab-071015- 05/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9013B	4.08	-0.230	3.23	2.37	1.75	1.29
JsT-Ab-071015- 06/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	PMLN5011A	4.12	-0.254	3.06	2.24	1.65	1.21
JsT-Ab-071015- 07/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	RLN5411A	4.07	-0.255	3.61	2.65	1.98	1.45
JsT-Ab-071015- 08/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	RMN4016B	4.10	-0.275	3.37	2.47	1.84	1.35
JsT-Ab-071015- 09/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	RLN5318A	4.06	-0.230	3.32	2.44	1.81	1.33
JsT-Ab-071015- 10/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	HMN9021A	4.08	-0.225	3.06	2.25	1.66	1.22
JsT-Ab-071015- 11/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	RMN5047A	4.02	-0.221	3.41	2.51	1.87	1.38
JsT-Ab-071015- 12/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	BDN6646C	4.07	-0.238	3.95	2.91	2.15	1.59
JsT-Ab-071015- 13/ 20	RAN4033A	454.0000	6080384Y10	Against the phantom	4280383X62	RLN5238B	4.02	-0.248	3.43	2.52	1.90	1.39

Table 1 (continue)

Assessments at the Body 438 - 470 MHz band												
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)
Band edges Assessment at the Body for RAN4031A Antenna												
JsT-Ab-071015-14/20	RAN4031A	438.0000	6080384Y10	Against the phantom	4280383X62	BDN6646C	4.12	-0.137	3.96	2.93	2.08	1.54
JsT-Ab-071015-15/20	RAN4031A	454.0000	6080384Y10	Against the phantom	4280383X62	BDN6646C	4.13	-0.336	3.39	2.50	1.86	1.37
MeC-Ab-071015-16/20	RAN4031A	470.0000	6080384Y10	Against the phantom	4280383X62	BDN6646C	4.08	-0.663	4.23	3.13	2.54	1.88
Band edges Assessment at the Body for RAN4033A Antenna												
MeC-Ab-071015-17/20	RAN4033A	438.0000	6080384Y10	Against the phantom	4280383X62	BDN6646C	4.13	-0.309	6.21	4.57	3.39	2.50
MeC-Ab-071015-18/20	RAN4033A	470.0000	6080384Y10	Against the phantom	4280383X62	BDN6646C	4.10	-0.619	4.73	3.47	2.79	2.05
2.5cm Assessment at the Body for RAN4031A Antenna												
MeC-Ab-071015-19/20	RAN4031A	470.0000	6080384Y10	DUT Back w/ Ant @ 2.5cm	None	BDN6646C	4.09	-0.480	5.91	4.34	3.39	2.49
MeC-Ab-071015-20/20	RAN4031A	470.0000	6080384Y10	DUT Back @ 2.5cm	None	BDN6646C	4.11	-0.588	2.42	1.79	1.42	1.05
MeC-Ab-071015-21/20	RAN4031A	470.0000	6080384Y10	DUT Front @ 2.5cm	None	BDN6646C	4.10	-0.527	3.10	2.30	1.79	1.33
2.5cm Assessment at the Body for RAN4033A Antenna												
MeC-Ab-071015-22/20	RAN4033A	438.0000	6080384Y10	DUT Back w/ Ant @ 2.5cm	None	BDN6646C	4.12	-0.353	6.94	5.10	3.84	2.82
MeC-Ab-071015-23/20	RAN4033A	438.0000	6080384Y10	DUT Back @ 2.5cm	None	BDN6646C	4.14	-0.303	4.06	3.02	2.21	1.64
MeC-Ab-071015-24/20	RAN4033A	438.0000	6080384Y10	DUT Front @ 2.5cm	None	BDN6646C	4.11	-0.350	4.38	3.25	2.43	1.80

Table 2

Assessments at the Face 438 - 470 MHz band												
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)
Antennas Assessment at the Face												
JsT-Face-071016-02/20	RAN4031A	454.0000	6080384X63	DUT Front @ 2.5cm	None	None	4.07	-0.310	3.36	2.49	1.86	1.38
JsT-Face-071016-03/20	RAN4033A	454.0000	6080384X63	DUT Front @ 2.5cm	None	None	4.12	-0.269	3.18	2.37	1.72	1.29
Other Batteries Assessment at the Face												
JsT-Face-071016-04/20	RAN4031A	454.0000	6080384X65	DUT Front @ 2.5cm	None	None	4.02	-0.0894	3.19	2.37	1.70	1.26
JsT-Face-071016-05/20	RAN4031A	454.0000	6080384Y10	DUT Front @ 2.5cm	None	None	4.11	-0.301	3.35	2.50	1.83	1.37
MeC-Face-071024-08/20	RAN4031A	454.0000	RHN1005A w/ AA Alkaline battery	DUT Front @ 2.5cm	None	None	2.01	-0.577	1.62	1.21	1.10	0.83
Other Audio Accessories Assessment at the Face												
JsT-Face-071016-06/20	RAN4031A	454.0000	6080384X63	DUT Front @ 2.5cm	None	BDN6720A	4.19	-0.281	3.14	2.33	1.68	1.25
JsT-Face-071016-07/20	RAN4031A	454.0000	6080384X63	DUT Front @ 2.5cm	None	HMN9727B	4.11	-0.296	3.20	2.38	1.75	1.30
JsT-Face-071016-08/20	RAN4031A	454.0000	6080384X63	DUT Front @ 2.5cm	None	HLN9132A	4.12	-0.447	3.15	2.34	1.78	1.32
JsT-Face-071016-09/20	RAN4031A	454.0000	6080384X63	DUT Front @ 2.5cm	None	HMN9752B	4.07	-0.392	3.24	2.41	1.83	1.36
Band edges Assessment at the Face for RAN4031A Antenna												
JsT-Face-071016-10/20	RAN4031A	438.0000	6080384X63	DUT Front @ 2.5cm	None	None	4.20	-0.432	4.51	3.36	2.49	1.86
JsT-Face-071016-11/20	RAN4031A	470.0000	6080384X63	DUT Front @ 2.5cm	None	None	4.00	-0.513	3.74	2.77	2.21	1.64
Band edges Assessment at the Face for RAN4033A Antenna												
JsT-Face-071016-12/20	RAN4033A	438.0000	6080384X63	DUT Front @ 2.5cm	None	None	4.21	-0.410	6.05	4.50	3.32	2.47
JsT-Face-071016-13/20	RAN4033A	470.0000	6080384X63	DUT Front @ 2.5cm	None	None	3.99	-0.473	3.24	2.39	1.90	1.40

Table 3

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)
Full Scan JsT- Face-071016-15/ 20	RAN4033A	438.0000	6080384X63	DUT Front @ 2.5cm	None	None	4.23	-0.518	5.91	4.31	3.33	2.43
Full Scan MeC- Ab-071015-26/ 20	RAN4033A	438.0000	6080384Y10	DUT Back w/ Ant @ 2.5cm	None	BDN6646C	4.12	-0.434	6.53	4.70	3.68	2.65
Shortened Scan MeC-Ab-071015- 28/ 20	RAN4033A	438.0000	6080384Y10	DUT Back w/ Ant @ 2.5cm	None	BDN6646C	4.11	-0.0935	7.03	5.05	3.67	2.64

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 5x5x7 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:

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

$$P_{\text{max}} = \text{Maximum Power (W)}$$

$$P_{\text{int}} = \text{Initial Power (W)}$$

$$\text{Pdrift} = \text{DASY drift results (dB) - (for conservative results positive drifts are not accounted for)}$$

$$\text{SAR}_{\text{meas.}} = \text{Measured 1-g/10-g Avg. SAR (mW/g)}$$

$$\text{DC \%} = \text{Transmission mode duty cycle in \% where applicable}$$

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: AZ489FT4882 models PMUE3031A.

Max. Calc. : 1-g Avg. SAR: 3.68 W/kg (Body); 10-g Avg. SAR: 2.65 W/kg (Body)
Max. Calc. : 1-g Avg. SAR: 3.33 W/kg (Face); 10-g Avg. SAR: 2.43 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

<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 = c x f / e</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	

FCD-0558 Rev 5

Uncertainty Budget for System Validation (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 = c x f / e</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	

FCD-0558 Rev 5

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
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**

Client **Motorola CGISS**

Certificate No: **ET3-1545_Aug07**

CALIBRATION CERTIFICATE

Object **ET3DV6R - SN:1545**

Calibration procedure(s) **QA CAL-01.v6 and QA CAL-12.v5
Calibration procedure for dosimetric E-field probes**

Calibration date: **August 28, 2007**

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	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08
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 Oct-06)	In house check: Oct-07

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

Issued: August 29, 2007

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



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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
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

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.

ET3DV6R SN:1545

August 28, 2007

Probe ET3DV6R

SN:1545

Manufactured:	October 16, 2000
Last calibrated:	September 21, 2006
Recalibrated:	August 28, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6R SN:1545

August 28, 2007

DASY - Parameters of Probe: ET3DV6R SN:1545

Sensitivity in Free Space^A

Diode Compression^B

NormX	2.03 ± 10.1%	μV/(V/m) ²	DCP X	96 mV
NormY	2.23 ± 10.1%	μV/(V/m) ²	DCP Y	95 mV
NormZ	1.85 ± 10.1%	μV/(V/m) ²	DCP Z	95 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 _{bo} [%]	Without Correction Algorithm	5.8	2.6
SAR _{bo} [%]	With Correction Algorithm	0.1	0.1

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{bo} [%]	Without Correction Algorithm	13.6	9.1
SAR _{bo} [%]	With Correction Algorithm	0.8	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%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

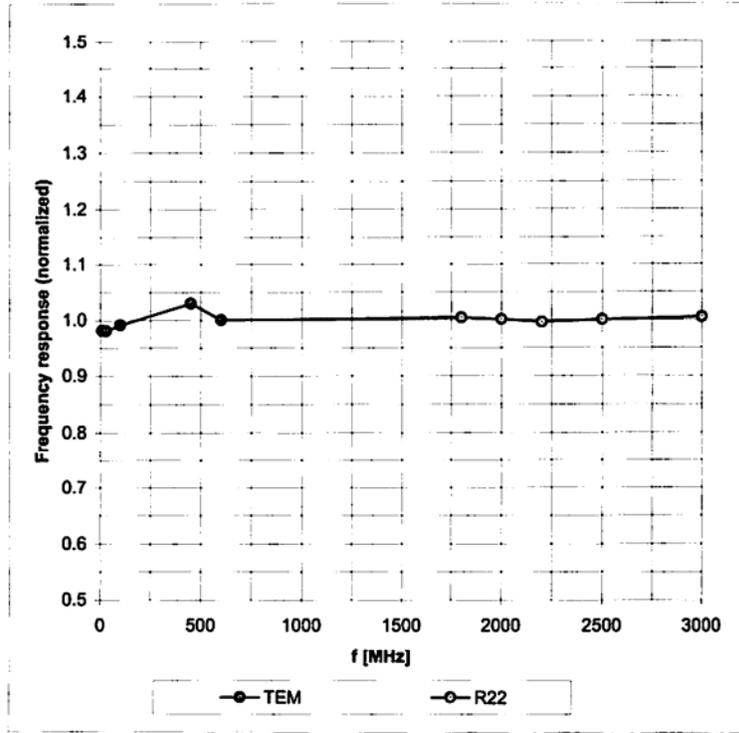
^B Numerical linearization parameter: uncertainty not required.

ET3DV6R SN:1545

August 28, 2007

Frequency Response of E-Field

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

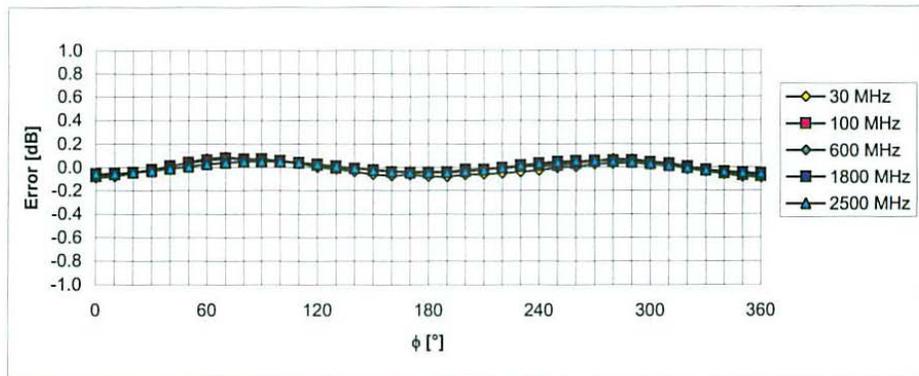
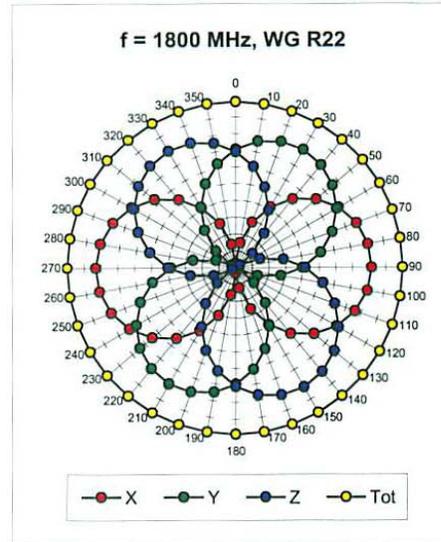
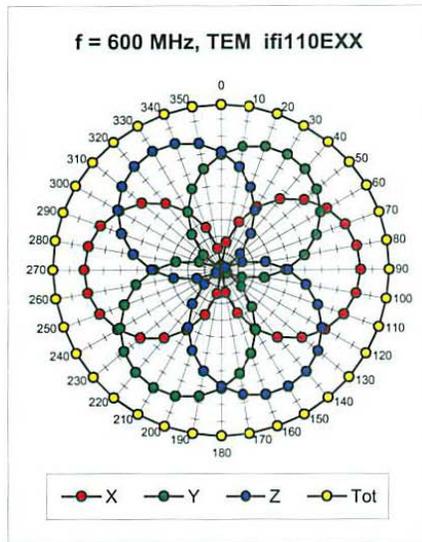


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

ET3DV6R SN:1545

August 28, 2007

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

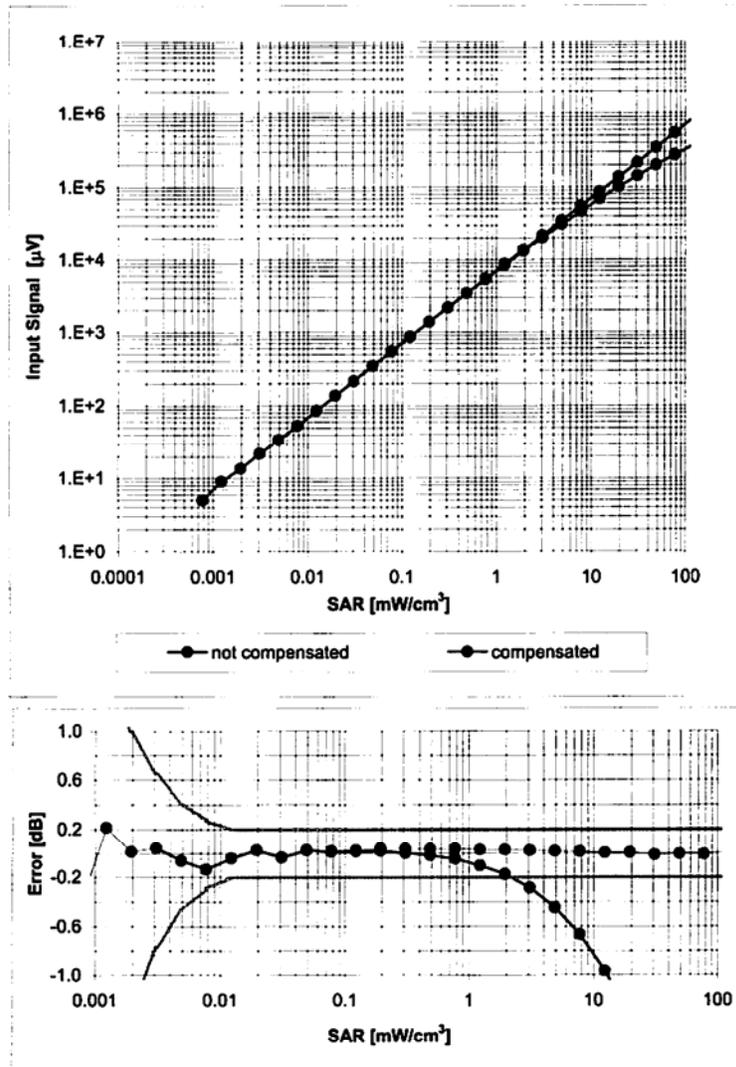


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

ET3DV6R SN:1545

August 28, 2007

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

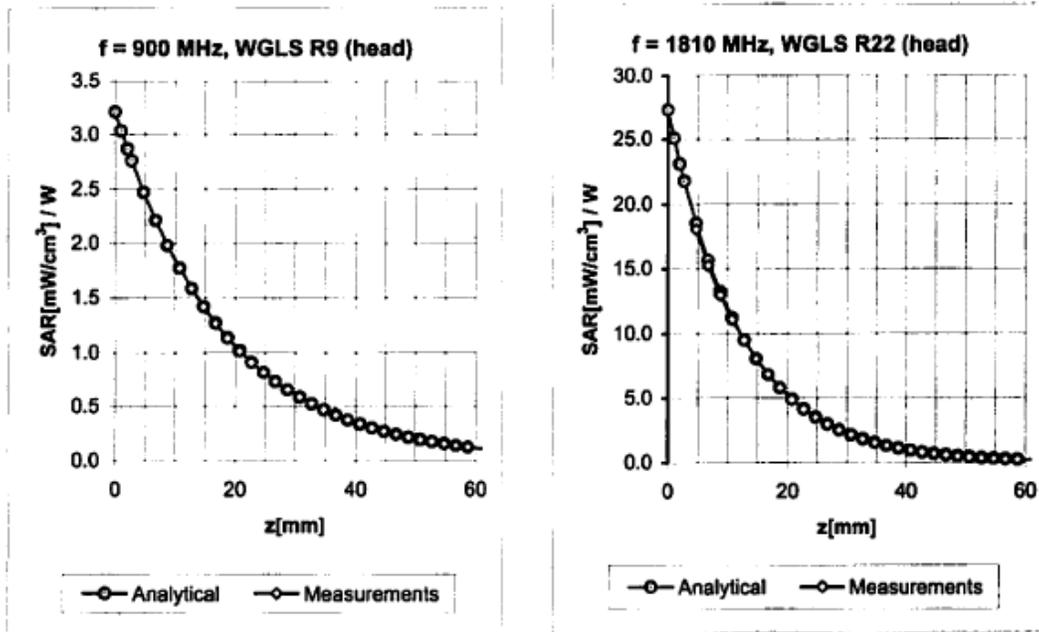


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6R SN:1545

August 28, 2007

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%	0.38	1.92	6.66 ± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.36	2.48	6.15 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.46	4.85 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.62	2.40	4.67 ± 11.0% (k=2)
2300	± 50 / ± 100	Head	39.4 ± 5%	1.71 ± 5%	0.67	2.25	4.53 ± 11.8% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.83	1.72	4.32 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.31	1.94	7.14 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.39	2.54	5.68 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.63	2.59	4.39 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.81	2.17	4.17 ± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.65	2.08	4.01 ± 11.8% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.71	1.92	3.73 ± 11.8% (k=2)

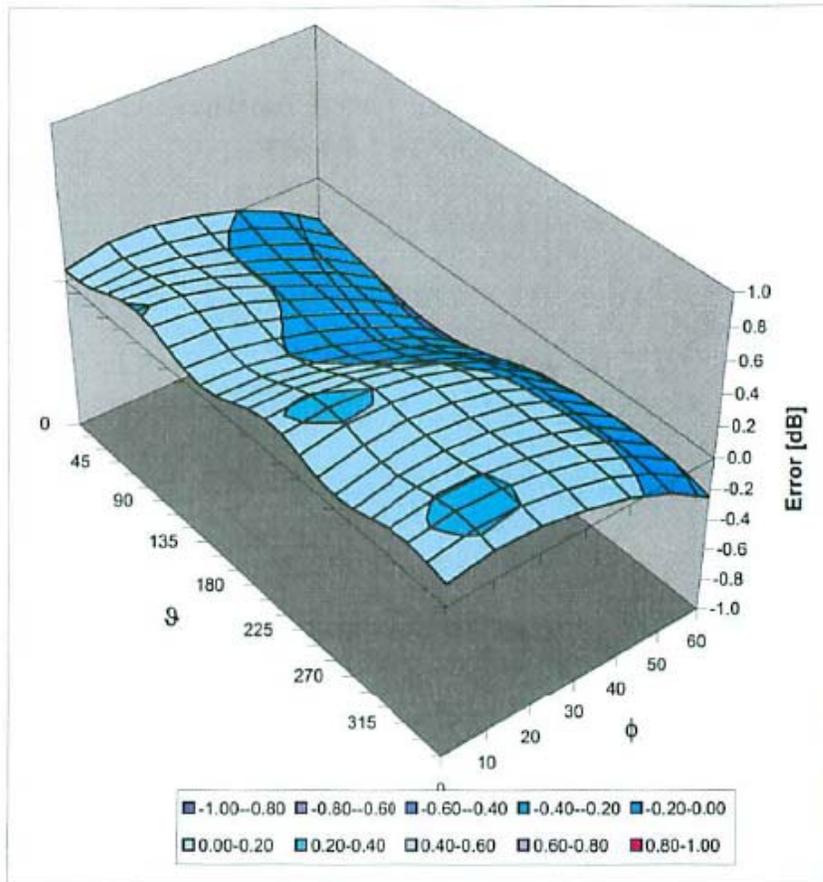
^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the R85 of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6R SN:1545

August 28, 2007

Deviation from Isotropy in HSL

Error (ϕ, ϑ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

Schmid & Partner Engineering AG

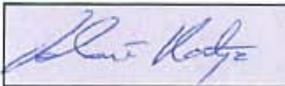
s p e a g

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info@speag.com, http://www.speag.com

Additional Conversion Factors for Dosimetric E-Field Probe

Type:	ET3DV6R
Serial Number:	1545
Place of Assessment:	Zurich
Date of Assessment:	August 31, 2007
Probe Calibration Date:	August 28, 2007

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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Dosimetric E-Field Probe ET3DV6R SN:1545

Conversion factor (\pm standard deviation)

150 MHz	<i>ConvF</i>	8.4 \pm 10 %	$\epsilon_r = 52.3$ $\sigma = 0.76$ mho/m (head tissue)
250 MHz	<i>ConvF</i>	7.6 \pm 10 %	$\epsilon_r = 47.6$ $\sigma = 0.83$ mho/m (head tissue)
300 MHz	<i>ConvF</i>	7.5 \pm 9 %	$\epsilon_r = 45.3$ $\sigma = 0.87$ mho/m (head tissue)
750 MHz	<i>ConvF</i>	6.4 \pm 7 %	$\epsilon_r = 41.9$ $\sigma = 0.89$ mho/m (head tissue)
150 MHz	<i>ConvF</i>	8.1 \pm 10 %	$\epsilon_r = 61.9$ $\sigma = 0.80$ mho/m (body tissue)
250 MHz	<i>ConvF</i>	7.6 \pm 10 %	$\epsilon_r = 59.4$ $\sigma = 0.88$ mho/m (body tissue)
300 MHz	<i>ConvF</i>	7.5 \pm 9 %	$\epsilon_r = 58.2$ $\sigma = 0.92$ mho/m (body tissue)
750 MHz	<i>ConvF</i>	6.2 \pm 7 %	$\epsilon_r = 55.5$ $\sigma = 0.96$ 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



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: **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	US3642UD1700	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

Calibrated by: **Katja Pokovic** (Name) / **Technical Manager** (Function) / *[Signature]* (Signature)

Approved by: **Fin Bomholt** (Name) / **R&D Director** (Function) / *[Signature]* (Signature)

Issued: May 25, 2006

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

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
- 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:

- 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 \pm 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 \pm 0.2) °C	43.6 \pm 6 %	0.86 mho/m \pm 6 %
Head TSL temperature during test	(22.0 \pm 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 \pm 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 \pm 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 $\mu\Omega$
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: $f = 450 \text{ MHz}$; $\sigma = 0.86 \text{ mho/m}$; $\epsilon_r = 43.6$; $\rho = 1000 \text{ kg/m}^3$

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

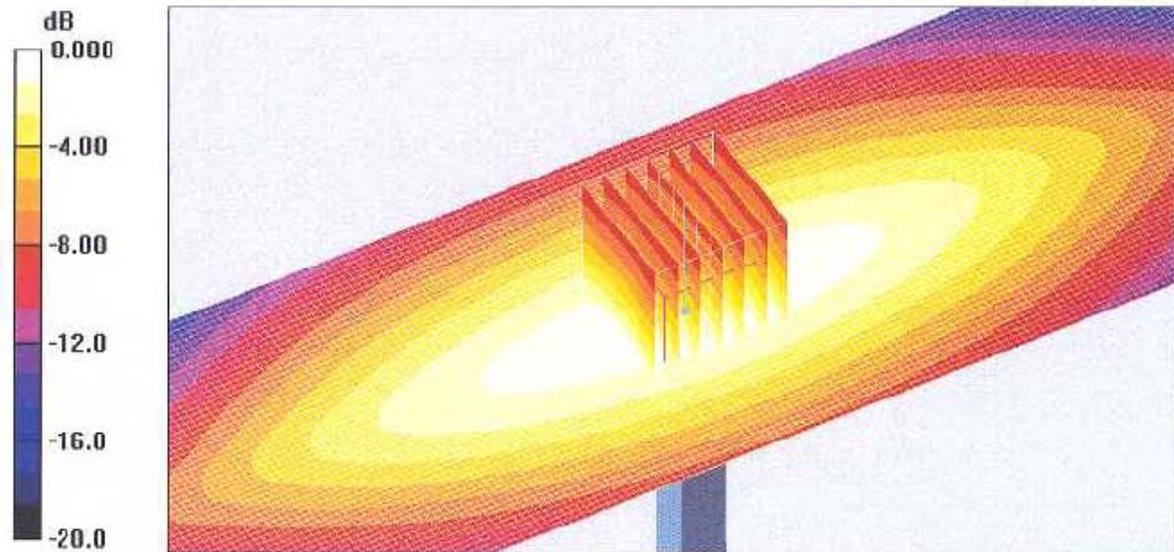
d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

