



MOTOROLA



Certificate Number: 1449-01

FCC ID: AZ489FT4873

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 2 of 2

CGISS EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

Date of Report: December 17, 2004
Report Revision: Rev. O
Report ID: FCC rpt_AlphaL UHF_Rev O_041217
SR1761

Responsible Engineer: Jim Fortier (Elect. Principal Staff Eng.)
Date/s Tested: 12/8/04 -12/9/04
Manufacturer/Location: Motorola
Sector/Group/Div.: CGISS/GTDG
DUT Description: Portable, PTT, Alpha L UHF 4W 450-470Mhz, 16ch, Black
Test TX mode(s): CW
Max. Power output: 4.5 Watts
Nominal Power: 4.0 Watts
Tx Frequency Bands: 450-470 MHz
Signaling type: FM
Model(s) Tested: PMUE2384A
Model(s) Certified: PMUE2384A
Serial Number(s): 027YEU0107
Classification: Occupational/Controlled
Rule Part(s): 90.210



Approved Accessories:

Antenna(s):
PMAE4020A (Alpha L antenna 450-470MHZ ¼ wave, 9cm, -3dBi)
Battery(ies):
PMNN4071A (NiMH battery)
Body worn accessory:
RLN5644A (Spring Belt clip); PMLN4691A (Standard Belt clip)
Audio Accessories:
PMMN4008A (RSM); PMLN4442A (Earbud w/ in-line mic & PTT/VOX switch); PMLN4443A (Ear receiver w/ in-line mic & PTT/VOX switch); PMLN4444A (Earphone Boom mic w/ in-line mic & PTT/VOX switch); PMLN4445A (Ultra lightweight headset w/ in-line PTT/VOX switch)

Max. Calc. 1-g/10-g Avg. SAR: 5.38/3.91 W/kg (Head/Face); 7.37/5.19 W/kg (Body)

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 CGISS EME Lab Senior Resource Manager,
Laboratory Director,

Certification Date: 12/17/04

Certification No.: L1041245

APPENDIX A
Measurement Uncertainty

Table 1: Uncertainty Budget for Device Under Test: 75 – 3000 MHz

<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>
Measurement System									
Probe Calibration	E.2.1	4.8	N	1.00	1	1	4.8	4.8	∞
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	1.0	N	1.00	1	1	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	1.3	R	1.73	1	1	0.8	0.8	∞
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	1.0	R	1.73	1	1	0.6	0.6	∞
Probe Positioning w.r.t Phantom	E.6.3	4.0	R	1.73	1	1	2.3	2.3	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.4	N	1.00	1	1	3.4	3.4	29
Device Holder Uncertainty	E.4.1	3.8	N	1.00	1	1	3.8	3.8	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	6.5	N	1.00	0.64	0.43	4.2	2.8	∞
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	4.0	N	1.00	0.6	0.49	2.4	2.0	∞
Combined Standard Uncertainty			RSS				12	11	601
Expanded Uncertainty (95% CONFIDENCE LEVEL)			<i>k</i> =2				23	22	

Table 2: Uncertainty Budget for System Check: 75 – 3000 MHz

a	b	c	d	e = f(d,k)	f	g	h =	i =	k
							c x f / e	c x g / e	
Uncertainty Component	IEEE 1528 section	Tol.	Prob.	Div.	c _i	c _i	1 g	10 g	v _i
		(± %)	Dist.		(1 g)	(10 g)	u _i	u _i	
							(±%)	(±%)	
Measurement System									
Probe Calibration	E.2.1	4.8	N	1.00	1	1	4.8	4.8	∞
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	1.0	N	1.00	1	1	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	1.3	R	1.73	1	1	0.8	0.8	∞
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	6.0	R	1.73	0.64	0.43	2.2	1.5	∞
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	6.0	R	1.73	0.6	0.49	2.1	1.7	∞
Combined Standard Uncertainty			RSS				9	8	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				17	17	

Notes for Tables 1 and 2

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

Appendix B
Probe Calibration Certification

**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: **ET3-1547_Sep04**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1547**

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

Calibration date: **September 29, 2004**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-May-04 (METAS, No. 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No. 251-00388)	May-05
Reference 3 dB Attenuator	SN: S5054 (3c)	3-Apr-03 (METAS, No. 251-00403)	Aug-05
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-04 (METAS, No. 251-00389)	May-05
Reference 30 dB Attenuator	SN: S5129 (30b)	3-Apr-03 (METAS, No. 251-00404)	Aug-05
Reference Probe ES3DV2	SN:3013	8-Jan-04 (SPEAG, No. ES3-3013_Jan04)	Jan-05
DAE4	SN: 617	26-May-04 (SPEAG, No. DAE4-617_May04)	May-05

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP B648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-03)	In house check: Nov 04

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

Issued: October 1, 2004

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

Schmid & Partner Engineering AG

s p e a g

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CF092004: Change in the Validity of the Probe Conversion Factor

METAS Accreditation

The Swiss Federal Office for Metrology and Accreditation (METAS) performed a review of the calibration laboratory of SPEAG on July 21, 2004. SPEAG successfully demonstrated that its management, calibration procedures and equipment met the stringent technical and quality standards set by METAS for calibration laboratories. SCS 108 accreditation has been officially approved on September 17, 2004. Our SCS certificates are internationally recognized through the Multilateral Agreements (MLA) between the EA, IAF and ILAC.

Sensitivity of the Conversion Factor for Frequency

METAS has accepted our new procedure to approximate the frequency dependence of the Conversion Factor (ConvF) by a linear function of frequency. This allows extension of the validity of the calibration from ± 50 MHz to ± 100 MHz with the same accuracy. The new procedure is implemented into the DASY v4.3 Build ≥ 17 software version, and officially released on September 21, 2004.

Probe Calibration Uncertainty for Usage in DASY3 Systems

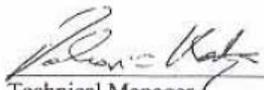
At the present time we are not able to provide accredited calibration for a frequency band larger than ± 50 MHz for any system with DASY4 software version 4.2 or less, including DASY3.

In case the system is used without frequency compensation, the total uncertainty of the probe conversion factor (ConvF) must be adjusted with the following formula:

$$Unc_{tot} = \sqrt{Unc_{ConvF}^2 + 109} \quad (k = 2)$$

whereby Unc_{ConvF} ($k=2$) is the ConvF uncertainty stated on the probe calibration document.

This would be analogous to the uncertainty assessment approved by METAS, even though METAS has not recognized this extension.


 Technical Manager

Zurich, September 22, 2004

CF092004

September 2004

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

Accreditation No.: **SCS 108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}:** Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY 4.3 B17 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 SN:1547

September 29, 2004

DASY - Parameters of Probe: ET3DV6 SN:1547

Sensitivity in Free Space ^A			Diode Compression ^B	
NormX	1.40 ± 9.9%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	88 mV
NormY	1.25 ± 9.9%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	88 mV
NormZ	1.25 ± 9.9%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	88 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL	900 MHz	Typical SAR gradient: 5 % per mm		
	Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
	SAR _{be} [%]	Without Correction Algorithm	10.3	5.4
	SAR _{be} [%]	With Correction Algorithm	0.5	0.0

TSL	1900 MHz	Typical SAR gradient: 10 % per mm		
	Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
	SAR _{be} [%]	Without Correction Algorithm	15.0	10.2
	SAR _{be} [%]	With Correction Algorithm	0.6	0.0

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).

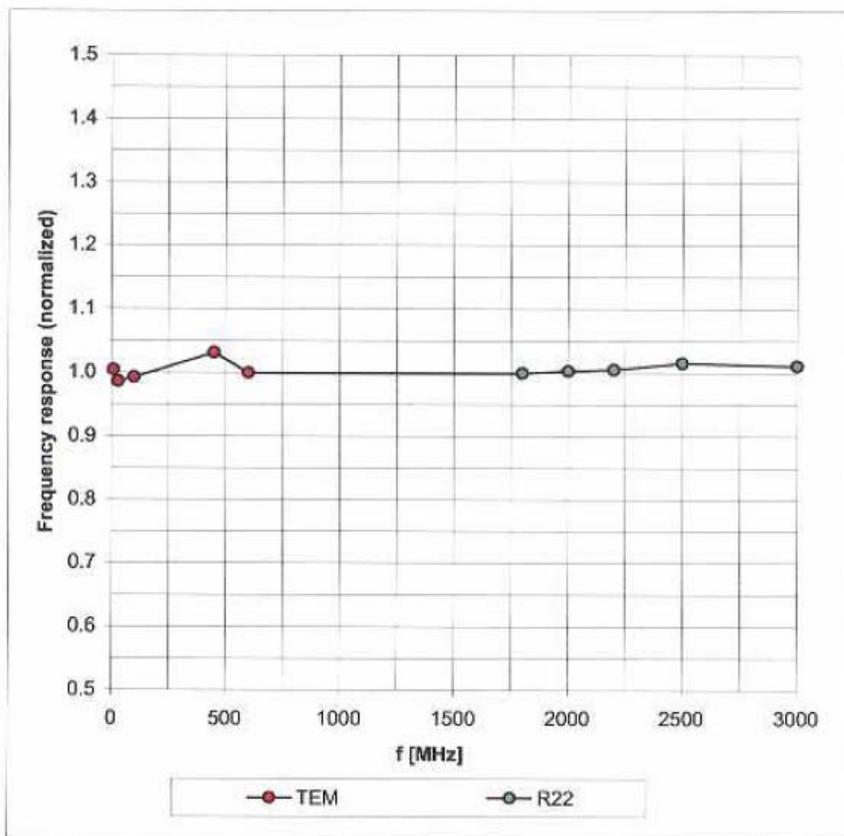
^B Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1547

September 29, 2004

Frequency Response of E-Field

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

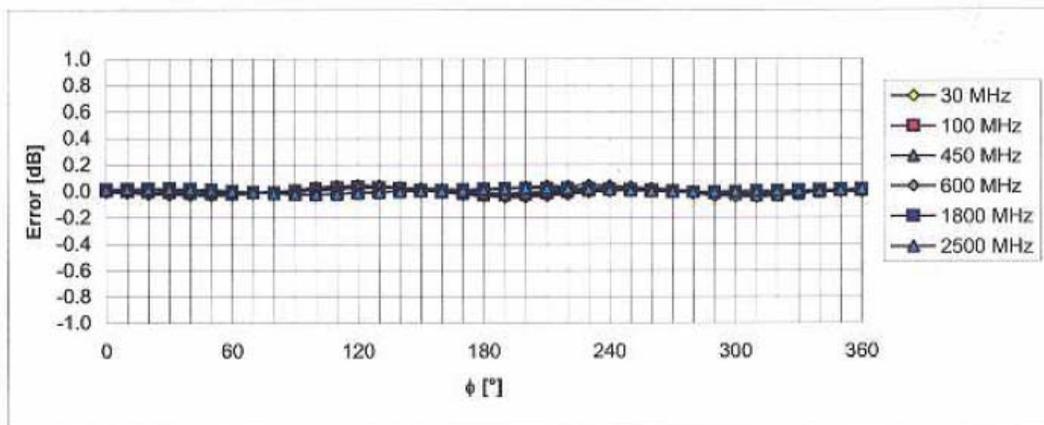
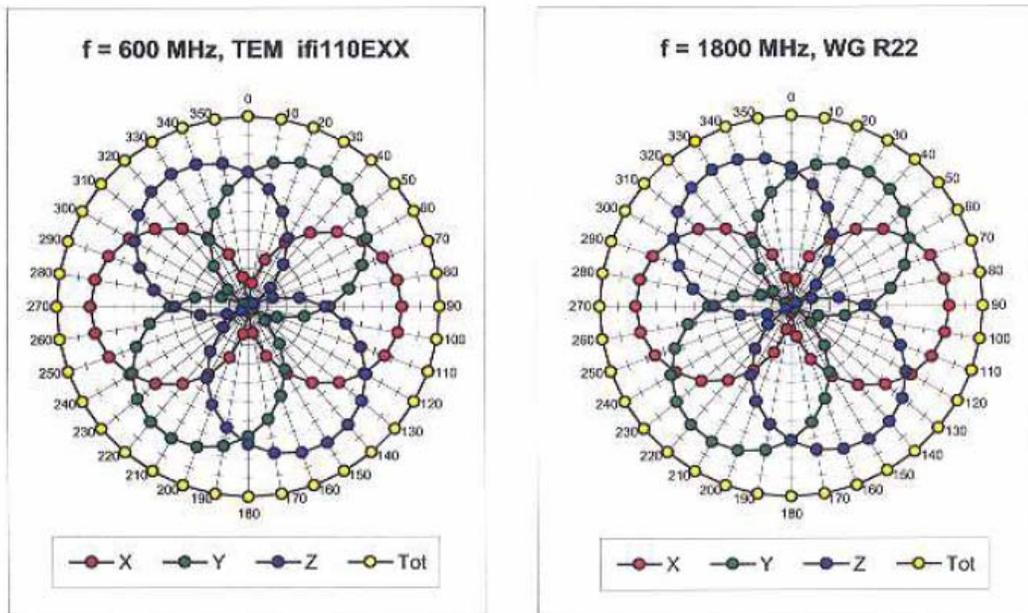


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

ET3DV6 SN:1547

September 29, 2004

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

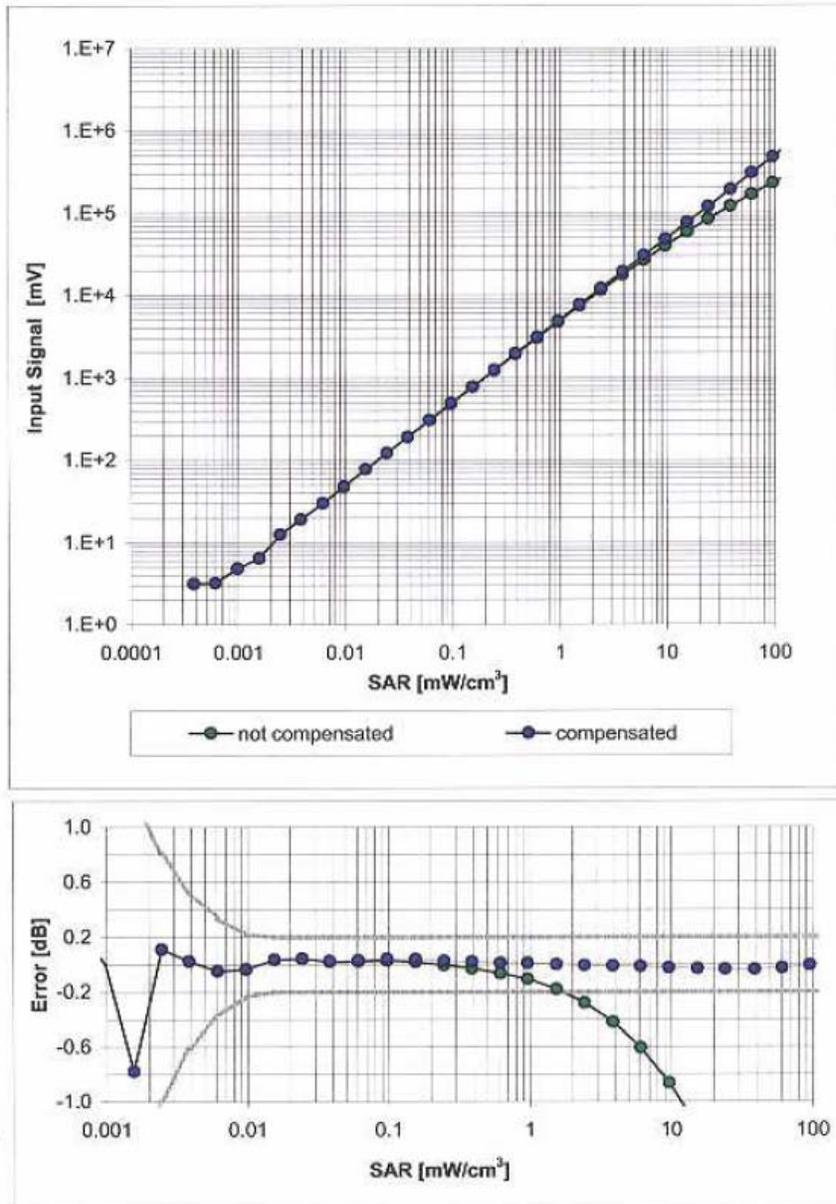


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ET3DV6 SN:1547

September 29, 2004

Dynamic Range $f(SAR_{head})$ (Waveguide R22, $f = 1800$ MHz)

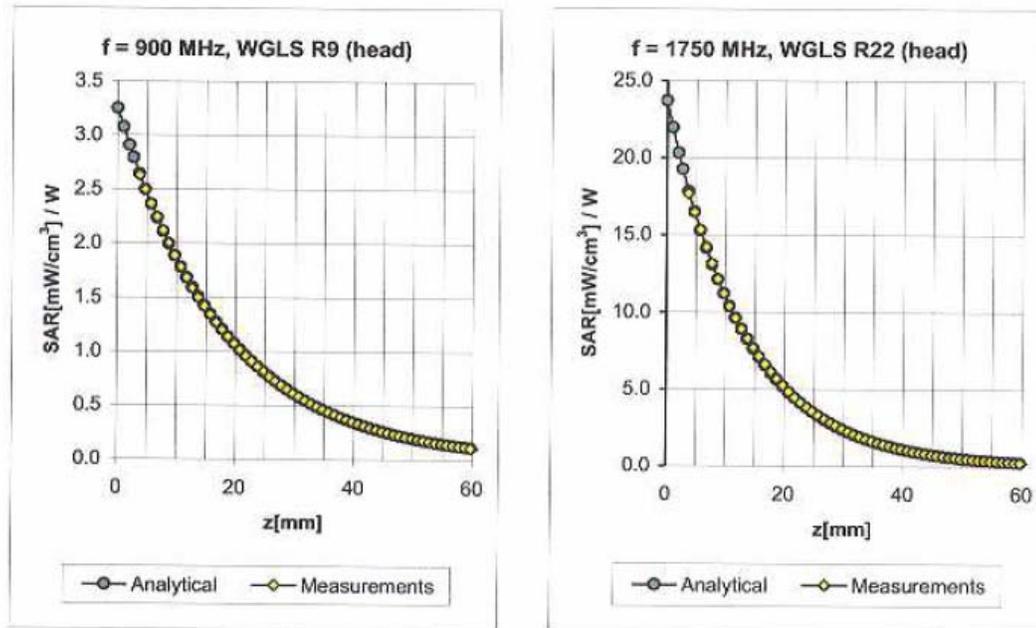


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6 SN:1547

September 29, 2004

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	1.14	1.48	6.44 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.04	1.56	6.24 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.58	2.44	5.18 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.64	4.99 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.69	2.32	4.46 ± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	1.05	1.59	6.24 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	1.00	1.64	5.95 ± 11.0% (k=2)
1750	± 50 / ± 99	Body	53.3 ± 5%	1.52 ± 5%	0.54	2.92	4.53 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.95	4.45 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.66	2.28	4.17 ± 11.8% (k=2)

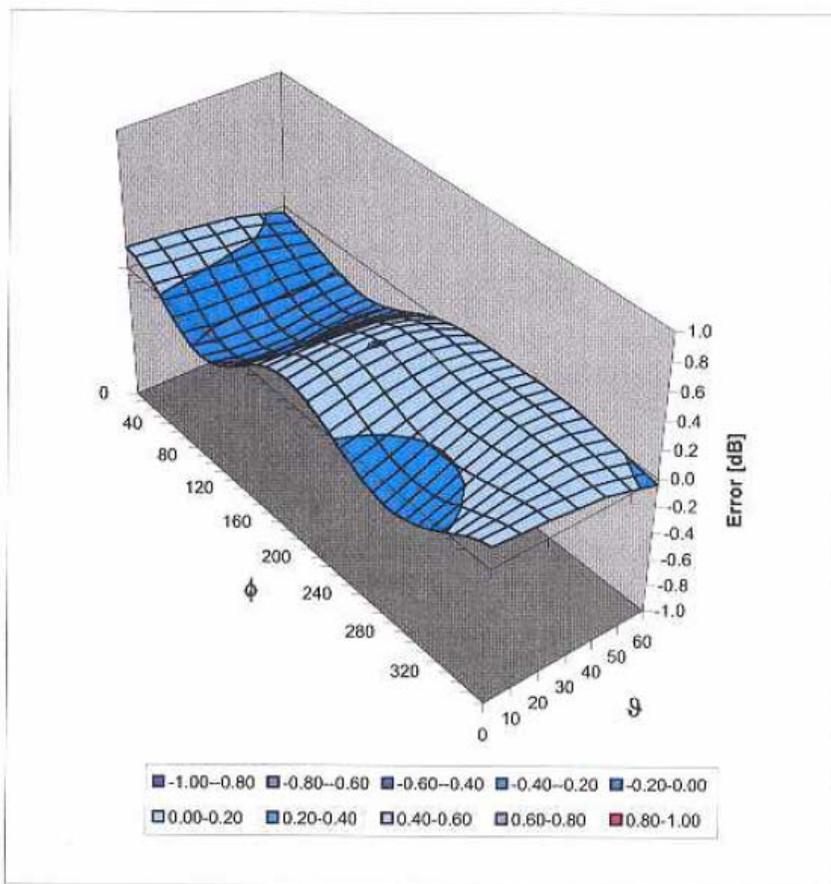
^c The validity of ± 100 MHz only applies for DASY 4.3 B17 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1547

September 29, 2004

Deviation from Isotropy in HSL

Error (ϕ , θ), $f = 900$ MHz

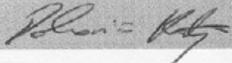
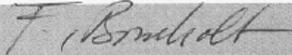


Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

Appendix C
Dipole Calibration Certificates

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

Client **Motorola CGISS**

CALIBRATION CERTIFICATE																																			
Object(s)	D450V2 - SN:1001																																		
Calibration procedure(s)	QA CAL-15.v2 Calibration procedure for dipole validation kits below 800 MHz																																		
Calibration date:	May 22, 2004																																		
Condition of the calibrated item	In Tolerance (according to the specific calibration document)																																		
<p>This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Model Type</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter EPM E4419B</td> <td>GB41293874</td> <td>5-May-04 (METAS, No 251-00388)</td> <td>May-05</td> </tr> <tr> <td>Power sensor E4412A</td> <td>MY41495277</td> <td>5-May-04 (METAS, No 251-00388)</td> <td>May-05</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: 5086 (20b)</td> <td>3-May-04 (METAS, No 251-00389)</td> <td>May-05</td> </tr> <tr> <td>Fluke Process Calibrator Type 702</td> <td>SN: 6295803</td> <td>8-Sep-03 (Sintrel SCS No. E-030020)</td> <td>Sep-04</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>MY41092180</td> <td>18-Sep-02 (SPEAG, in house check Oct-03)</td> <td>In house check: Oct 05</td> </tr> <tr> <td>RF generator HP 8684C</td> <td>US3642U01700</td> <td>4-Aug-99 (SPEAG, in house check Aug-02)</td> <td>In house check: Aug-05</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585</td> <td>18-Oct-01 (SPEAG, in house check Oct-03)</td> <td>In house check: Oct 05</td> </tr> </tbody> </table>				Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration	Power meter EPM E4419B	GB41293874	5-May-04 (METAS, No 251-00388)	May-05	Power sensor E4412A	MY41495277	5-May-04 (METAS, No 251-00388)	May-05	Reference 20 dB Attenuator	SN: 5086 (20b)	3-May-04 (METAS, No 251-00389)	May-05	Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04	Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05	RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05	Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05
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	Name	Function	Signature																																
Calibrated by:	Katja Pokovic	Laboratory Director																																	
Approved by:	Fin Bornholt	R&D Director																																	
Date issued: May 24, 2004																																			
<p>This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.</p>																																			

1. Measurement Conditions

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

Relative Dielectricity	45.1	$\pm 5\%$
Conductivity	0.85 mho/m	$\pm 5\%$

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

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

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

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

2. SAR Measurement with DASY System

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

averaged over 1 cm ³ (1 g) of tissue:	5.28 mW/g $\pm 20.7\%$ (k=2)¹
averaged over 10 cm ³ (10 g) of tissue:	3.52 mW/g $\pm 20.2\%$ (k=2)¹

3. Dipole Impedance and Return Loss

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

Electrical delay:	1.346 ns	(one direction)
Transmission factor:	0.991	(voltage transmission, one direction)

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

Feedpoint impedance at 450 MHz:	$\text{Re}\{Z\} = 53.0 \Omega$
	$\text{Im}\{Z\} = -11.1 \Omega$
Return Loss at 450 MHz	-19.2 dB

4. Handling

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

5. Design

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

6. Power Test

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

Test Laboratory: SPEAG, Zurich, Switzerland
DUT: Dipole 450 MHz; Serial: D450V2 - SN:1001

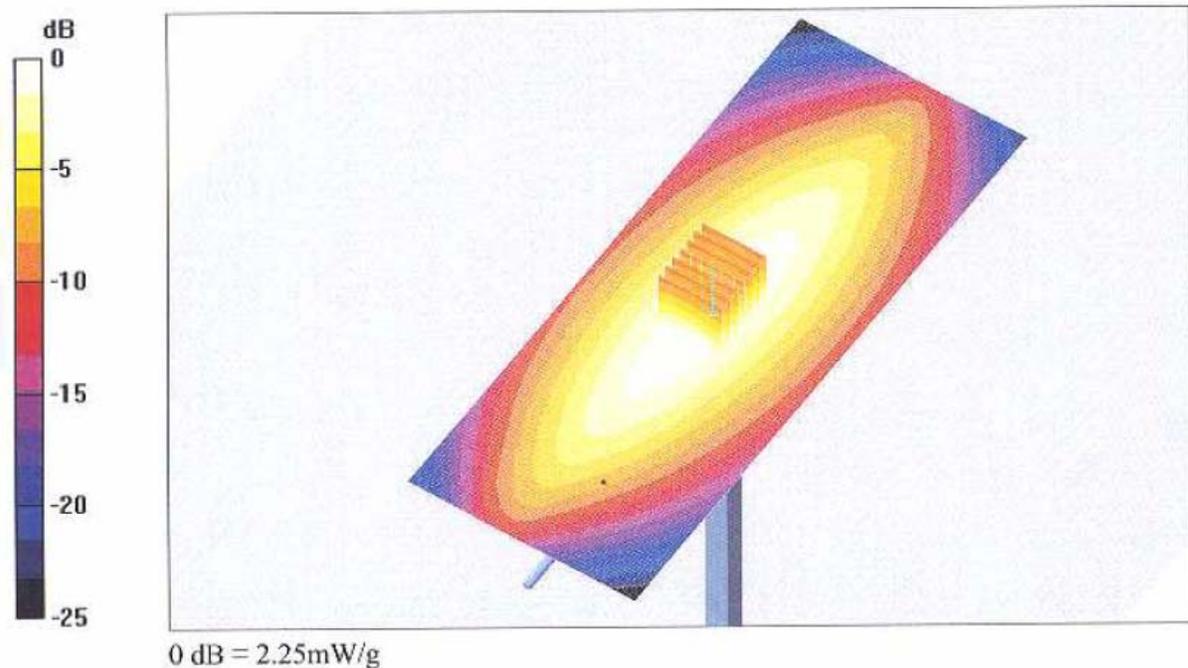
Communication System: CW; Duty Cycle: 1:1; Medium: HSL450
 Medium parameters used: $f = 450 \text{ MHz}$; $\sigma = 0.85 \text{ mho/m}$; $\epsilon_r = 45.1$; $\rho = 1000 \text{ kg/m}^3$
 Phantom: Flat Phantom 4.4; Phantom section: Flat Section

DASY4 Configuration:

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

d=15mm, Pin=398mW/Area Scan (71x181x1): Measurement grid: dx=15mm, dy=15mm
 Reference Value = 52.5 V/m; Power Drift = -0.0 dB
 Maximum value of SAR (interpolated) = 2.21 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 52.5 V/m; Power Drift = -0.0 dB
 Maximum value of SAR (measured) = 2.25 mW/g
 Peak SAR (extrapolated) = 3.18 W/kg
SAR(1 g) = 2.1 mW/g; SAR(10 g) = 1.4 mW/g



Appendix D
Test System Verification Scans

SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 12/08/04

Motorola CGISS EME Lab

Run #: Sys Perf-R1-041208-01

TX Freq: 450 MHz

Sim Tissue Temp: 20.6 C

Start Power: 250mW

SAR target at 1W is 4.58 mW/g (1g avg, including drift)

SAR target at 1W is 3.13 mW/g (10g avg, including drift)

SAR calculated 1g is 4.50 mW/g percent from target (including drift) is - 1.76 %

SAR calculated 10g is 2.97 mW/g Percent from target (including drift) is - 4.98 %

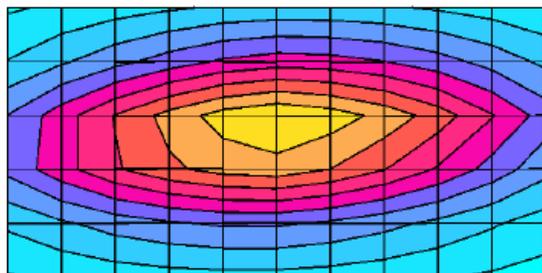
Flat Phantom; Probe: ET3DV6 - SN1547(Cal Date 29 Sept 2004); ConvF(7.10,7.10,7.10); Probe cal date: 29/9/04; Crest

factor: 1.0; FCC Body 450 MHz: $\sigma = 0.92$ mho/m $\epsilon_r = 55.6$ $\rho = 1.00$ g/cm³; DAE3: SN:363 (5/26/04)

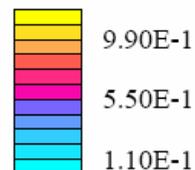
Cubes (2): SAR (1g): 1.13 mW/g ± 0.04 dB, SAR (10g): 0.747 mW/g ± 0.04 dB, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 33.0, 75.0, 4.7

Power drift: 0.02 dB



SAR_{Tot} [mW/g]



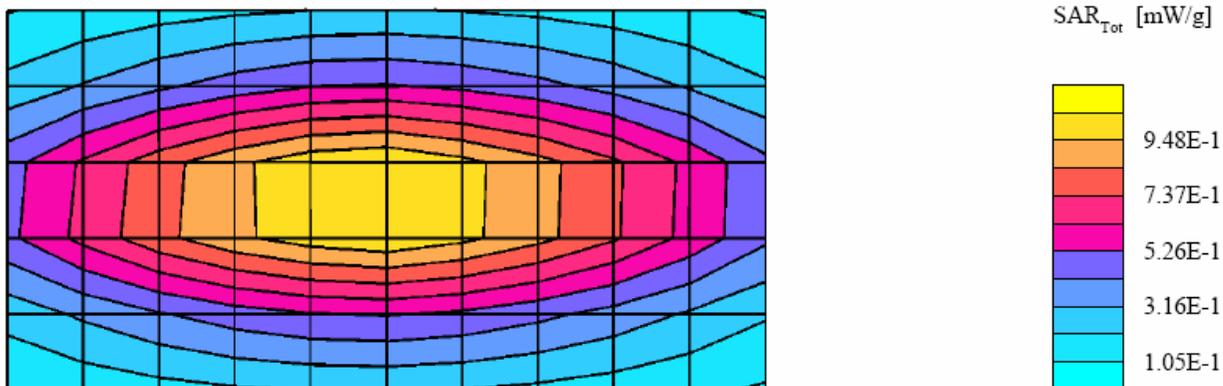
SPEAG 450 MHz Dipole; Model D450V2, SN 1001; Test Date: 12/09/04

Motorola CGISS EME Lab

Run #: Sys Perf-R1-041209-01
 TX Freq: 450 MHz
 Sim Tissue Temp: 20.6 C
 Start Power: 250mW

SAR target at 1W is 4.58 mW/g (1g avg, including drift)
 SAR target at 1W is 3.13 mW/g (10g avg, including drift)
 SAR calculated 1g is 4.59 mW/g percent from target (including drift) is + 0.21 %
 SAR calculated 10g is 2.97 mW/g Percent from target (including drift) is - 3.3 %

Flat Phantom; Probe: ET3DV6 - SN1547(Cal Date 29 Sept 2004);Probe Cal Date: 29/9/04ConvF(7.10,7.10,7.10); Crest factor: 1.0; FCC Body 450 MHz: $\sigma = 0.92\text{mho/m}$ $\epsilon_r = 55.4$ $\rho = 1.00 \text{ g/cm}^3$; DAE3: SN:363 (5/26/04)
 Cubes (2): Peak: 1.77 mW/g $\pm 0.02 \text{ dB}$, SAR (1g): 1.15 mW/g $\pm 0.02 \text{ dB}$, SAR (10g): 0.759 mW/g $\pm 0.03 \text{ dB}$, (Worst-case extrapolation)Penetration depth: 12.7 (11.4, 14.3) [mm]
 Power drift: 0.01 dB



SYSTEM PERFORMANCE CHECK TARGET SAR

Date: 08/05/2004 Frequency (MHz): 450
 Lab Location: CGISS Mixture Type: 450-FCC Body
 Robot System: CGISS-2 Ambient Temp.(°C): 20.7
 Probe Serial #: 1393 Tissue Temp.(°C): 20.3
 DAE Serial #: DAE3V1 SN374

Tissue Characteristics Phantom Type/SN: 80602002C/S7
 Permittivity: 55.8 Distance (mm): 15
 Conductivity: 0.92

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

Measured SAR Value: 1.15 mW/g (1g avg.), 0.768 mW/g (10g avg.)
 Power Drift: 0.02 dB

New Target/Measured SAR Value: 4.58 mW/g (1g avg.), 3.13 mW/g (10g avg.)
 (Normalized to 1.0 W,
 with drift compensation)

Test performed by: Kim Uong

Initial: 

Dipole D450V2 ; Test date:08/05/04

Run #: Sys Perf-R2-040805-02
 Model #: D450V2 SN: 1001
 Robot: CGISS-2
 TX Freq: 450 MHz
 Start Power: 250mW

Phantom #: 80302002C/S7
 Tester: K. Uong
 DAE3: SN: 374 (3/23/04)
 Sim Tissue Temp: 20.3 C

Target:

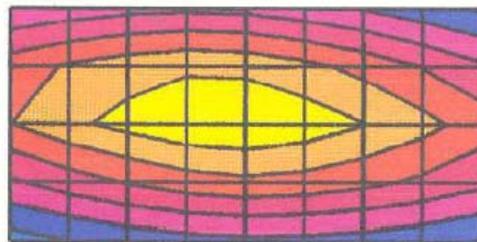
4.58 mW/g for 1g SAR, 3.13 mW/g for 10g SAR +/- 10% from system performance target

Flat (2); Probe: ET3DV6 - SN1393 (Cal Date 28/04/04); ConvF(7.70,7.70,7.70); Crest factor: 1.0; FCC Body 450: $\sigma = 0.92$ mho/m $\epsilon_r = 55.8$ $\rho = 1.00$ g/cm³

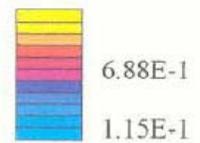
Cubes (2): Peak: 1.74 mW/g ± 0.02 dB, SAR (1g): 1.15 mW/g ± 0.03 dB, SAR (10g): 0.768 mW/g ± 0.03 dB, (Worst-case extrapolation)

Penetration depth: 13.2 (11.9, 14.9) [mm]

Powerdrift: 0.02 dB



SAR_{Tot} [mW/g]



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

Shortened Scan Results

FCC ID: AZ489FT4873; Test Date: 12/8/04

Motorola CGISS EME Laboratory

Run #: EC-Ab-R1-041208-19

Model #: PMUE2384A SN: 027YEU0107

TX Freq: 450.025 MHz

Sim Tissue Temp: 20.5 (Celsius)

Start Power: 4.50 W

Antenna: PMAE4020A

Battery Kit: PMNN4071A

Body worn Acc.: PMLN4691A

Audio/Data Acc.: PMLN4442A

Shortened scan reflect highest S.A.R. producing configuration; Run time 7 minutes.

Representative “normal” scan run time was 23 minutes

“Shortened” scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 6.78mW/g; 10-g Avg. = 4.81mW/g

“Normal” scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 7.37mW/g; 10-g Avg. = 5.19mW/g

(see part 1 of 2 section 9.0 run # EC-Ab-R1-041208-18)

DUT w/ body worn accessory against the phantom

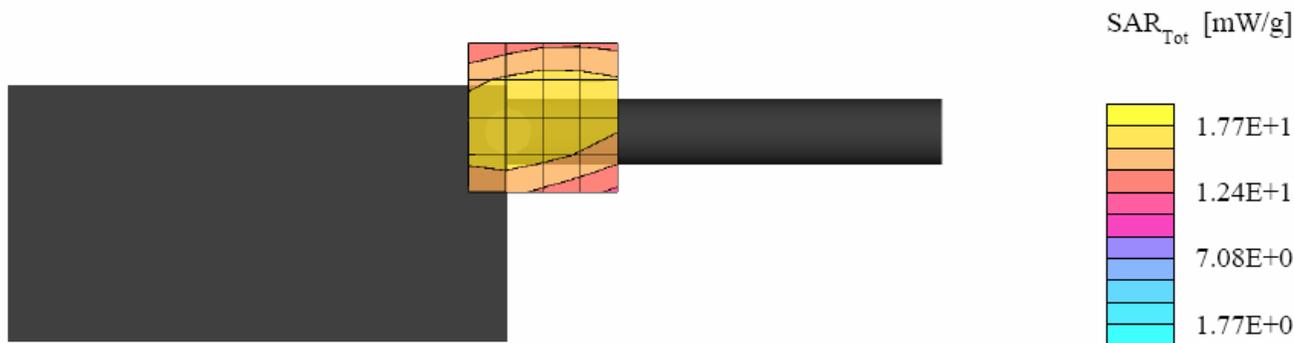
Flat Phantom; Device Section; Position: (90°, 90°);

Probe: ET3DV6 - SN1547(Cal Date 29 Sept 2004); ConvF(7.10,7.10,7.10); Probe cal date: 29/9/04; Crest factor: 1.0; FCC

Body 460 MHz: $\sigma = 0.93$ mho/m $\epsilon_r = 55.5$ $\rho = 1.00$ g/cm³; DAE SN: 363 DAE Cal Date: 05/26/04

Cube 5x5x7: SAR (1g): 12.4 mW/g, SAR (10g): 8.80 mW/g, (Worst-case extrapolation)

Power drift: -0.39 dB



FCC ID: AZ489FT4873; Test Date: 12/9/04

Motorola CGISS EME Laboratory

Run #: EC-Face-R1-041209-10

Model #: PMUE2384A SN: 027YEU0107

TX Freq: 450.025 MHz

Sim Tissue Temp: 20.5 (Celsius)

Start Power : 4.59 W

Antenna: PMAE4020A

Battery Kit: PMNN4071A

Body worn Acc.: None

Audio/Data Acc.: None

Shortened scan reflect highest S.A.R. producing configuration; Run time 7 minutes.

Representative “normal” scan run time was 23 minutes

“Shortened” scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 5.38mW/g; 10-g Avg. = 3.91mW/g

“Normal” scan max calculated S.A.R. using S.A.R. drift: 1-g Avg. = 5.00mW/g; 10-g Avg. = 3.63mW/g

(see part 1 of 2 section 9.0 run # EC-Ab-R1-041209-09)

DUT with front separated 2.5cm from phantom

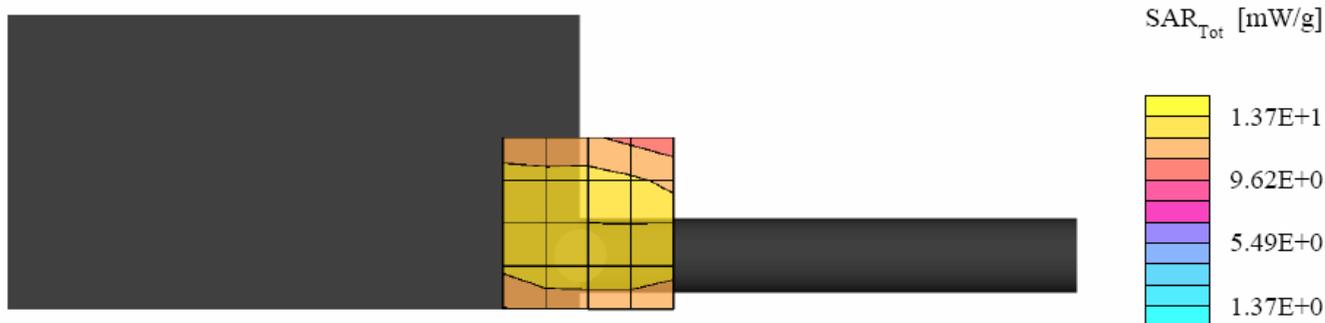
Flat Phantom; Device Section; Position: (90°,90°);

Probe: ET3DV6 - SN1547(Cal Date 29 Sept 2004); ConvF(7.00,7.00,7.00); Probe cal date: 29/9/04; Crest factor: 1.0; IEEE

Head 460 MHz: $\sigma = 0.88$ mho/m $\epsilon_r = 44.2$ $\rho = 1.00$ g/cm³; DAE SN: 363 DAE Cal Date: 05/26/04

Cube 5x5x7: SAR (1g): 9.82 mW/g, SAR (10g): 7.14 mW/g, (Worst-case extrapolation)

Power drift: -0.40 dB



Highest SAR Configurations Results

FCC ID: AZ489FT4873; Test Date: 12/8/04

Motorola CGISS EME Laboratory

Run #: EC-Ab-R1-041208-18

Model #: PMUE2384A SN: 027YEU0107

TX Freq: 450.025 MHz

Sim Tissue Temp: 20.5 (Celsius)

Start Power: 4.64 W

Antenna: PMAE4020A

Battery Kit: PMNN4071A

Body worn Acc.: PMLN4691A

Audio/Data Acc.: PMLN4442A

DUT w/ body worn accessory against the phantom

Flat Phantom; Device Section; Position: (90°,90°);

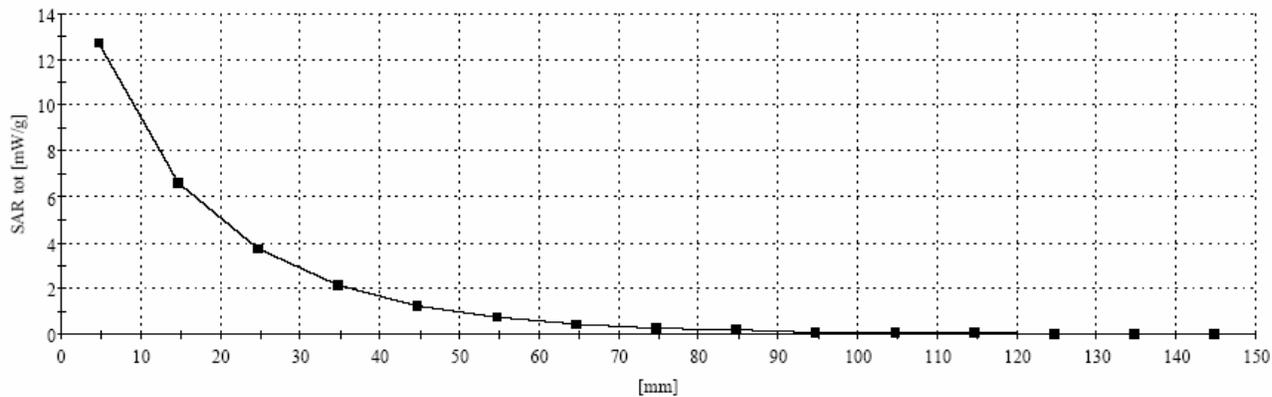
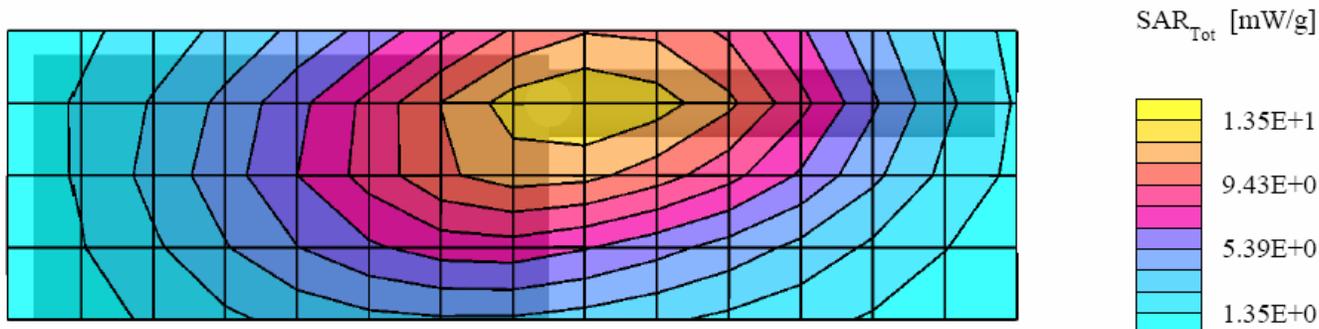
Probe: ET3DV6 - SN1547(Cal Date 29 Sept 2004); ConvF(7.10,7.10,7.10); Probe cal date: 29/9/04; Crest factor: 1.0; FCC

Body 460 MHz: $\sigma = 0.93$ mho/m $\epsilon_r = 55.5$ $\rho = 1.00$ g/cm³; DAE SN: 363 DAE Cal Date: 05/26/04

Cube 7x7x7: SAR (1g): 13.1 mW/g, SAR (10g): 9.23 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 15.0, 120.0, 4.7

Power drift: -0.51 dB



FCC ID: AZ489FT4873; Test Date: 12/9/04

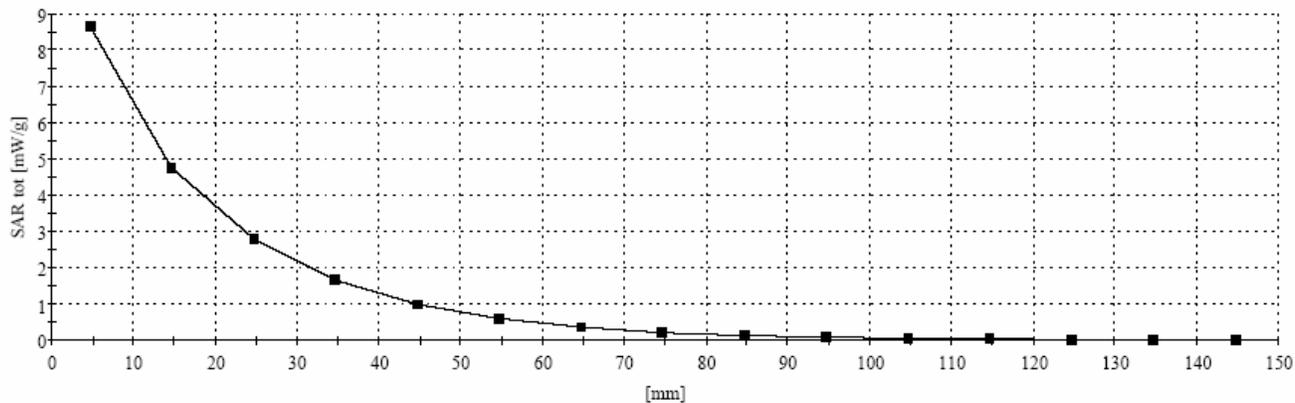
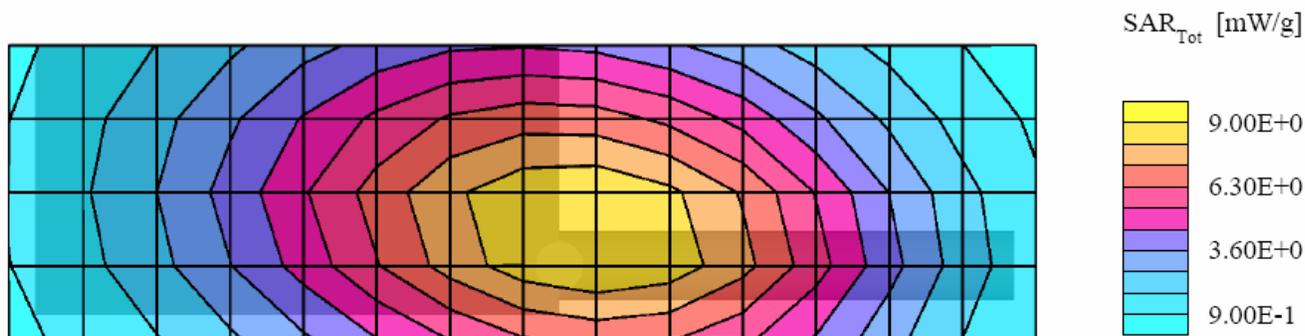
Motorola CGISS EME Laboratory

Run #: EC-Face-R1-041209-09
 Model #: PMUE2384A SN: 027YEU0107
 TX Freq: 450.025 MHz
 Sim Tissue Temp: 20.5 (Celsius)
 Start Power : 4.68 W

Antenna: PMAE4020A
 Battery Kit: PMNN4071A
 Body worn Acc.: None
 Audio/Data Acc.: None

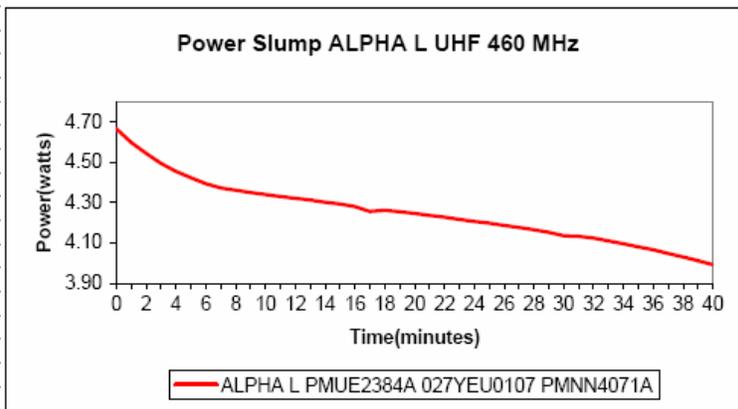
DUT w/ front separated 2.5cm from phantom (Face)

Flat Phantom; Device Section; Position: (90°,90°);
 Probe: ET3DV6 - SN1547(Cal Date 29 Sept 2004); ConvF(7.00,7.00,7.00); Probe cal date: 29/9/04; Crest factor: 1.0; IEEE
 Head 460 MHz: $\sigma = 0.88$ mho/m $\epsilon_r = 44.2$ $\rho = 1.00$ g/cm³; DAE SN: 363 DAE Cal Date: 05/26/04
 Cube 7x7x7: SAR (1g): 8.91 mW/g, SAR (10g): 6.47 mW/g, (Worst-case extrapolation)
 Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 37.5, 118.5, 4.7
 Power drift: -0.50 dB



APPENDIX F DUT Supplementary Data (Power slump)

Product Name	ALPHA L
Model #	PMUE2384A
Radio s/n	027YEU0107
Battery	PMNN4071A
Frequency(MHz)	460
Time(minutes)	Power(watts)
0	4.67
1	4.60
2	4.55
3	4.50
4	4.46
5	4.42
6	4.39
7	4.37
8	4.36
9	4.35
10	4.34
11	4.33
12	4.32
13	4.31
14	4.30
15	4.29
16	4.28
17	4.26
18	4.26
19	4.26
20	4.25
21	4.24
22	4.23
23	4.22
24	4.21
25	4.20
26	4.19
27	4.18
28	4.17
29	4.15
30	4.14
31	4.13
32	4.12
33	4.11
34	4.10
35	4.08
36	4.07
37	4.05
38	4.03
39	4.01
40	3.99



Appendix G DUT Test Position Photos

Figure 1: Highest S.A.R. Test Position (Body)
DUT with body worn accessory model PMLN4691A against the phantom.
 (Same position used for other offered audio accessories)

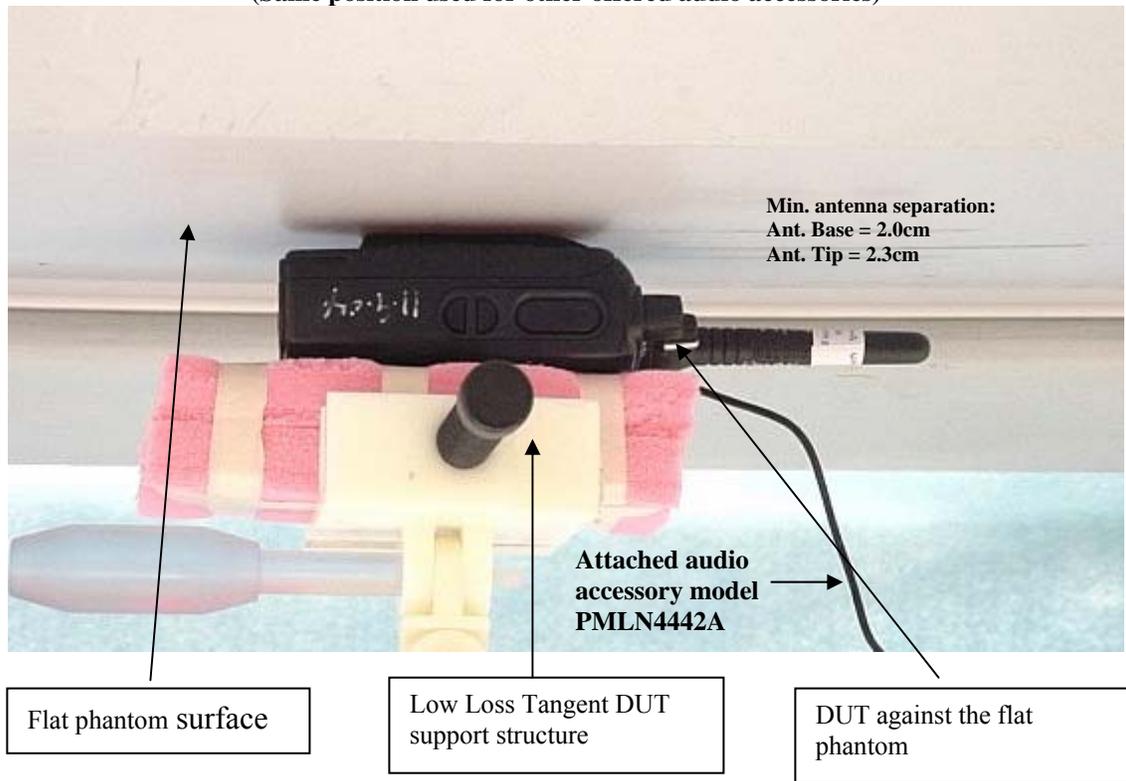


Figure 2: Body Assessment
DUT with body worn accessory model RLN5644A against the phantom.

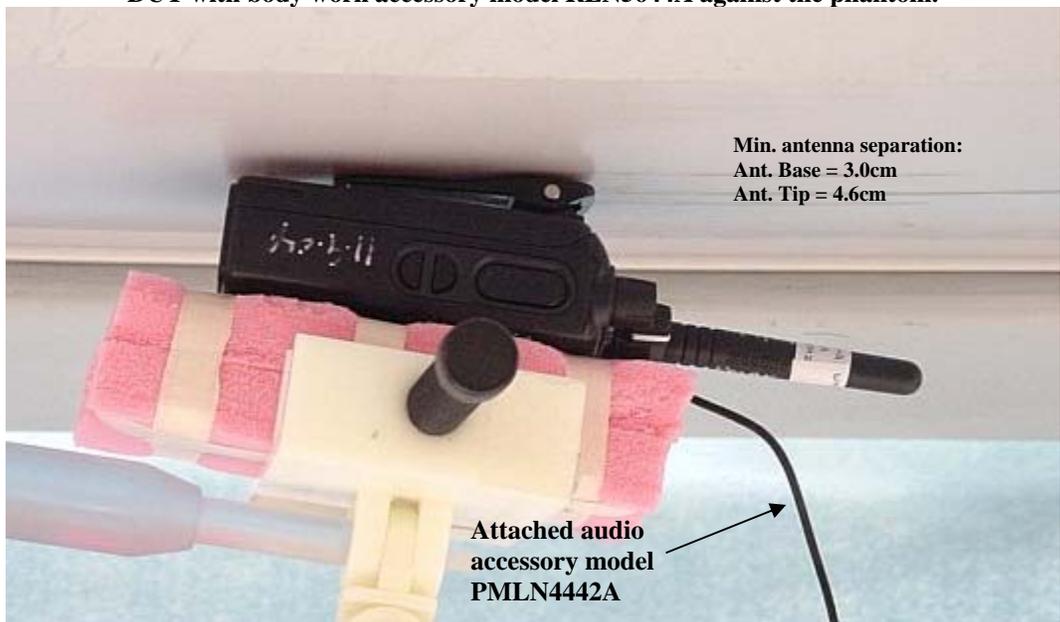


Figure 3: Body Assessment w/ front housing separated 2.5cm



Figure 4: Body Assessment w/ back housing separated 2.5cm



Figure 5: Body Assessment w/ antenna (back towards phantom) separated 2.5cm



Figure 2: Face Assessment – front housing separated 2.5cm



Appendix H DUT and Accessory Photos

The purpose of this appendix is to illustrate the body-worn carry accessories for FCC ID: AZ489FT4873. The sample that was used in the following photos represents the product used to obtain the results presented herein and was used in this section to demonstrate the different body-worn accessories.



Photo 1.
Model PMLN4691A
Back View



Photo 2.
Model PMLN4691A
Side View



Photo 3.
Model RLN5644A
Back View



Photo 4.
Model RLN5644A
Side View

Appendix I DUT Body-worn Separation Distances

The following table summarizes the test status and separation distance provided by each of the applicable body-worn accessories:

Carry Case Models	Tested ?	Min. Separation distances between DUT antenna and phantom surface. (mm)	Comments
PMLN4691A	Yes	20	NA
RLN5644A	Yes	30	NA

Audio Acc. Models	Tested ?	Separation distances between DUT antenna and phantom surface. (mm)	Comments
PMMN4008A	Yes	NA	NA
PMLN4442A	Yes	NA	NA
PMLN4443A	Yes	NA	NA
PMLN4444A	Yes	NA	NA
PMLN4445A	Yes	NA	NA