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ACCREDITED
TESTING CERT # 2518.05

FCC ID: AZ489FT4885
DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 3

Government & Public Safety
EME Test Laboratory
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Report Revision: O
Report ID: SAR rpt_PMUE3325AAN_Rev O_090414_SR7161

Responsible Engineer:	Pei Loo, Tey (EME Eng.)
Report Author:	Pei Loo, Tey (EME Eng.)
Date/s Tested:	3/19/09~3/25/09
Manufacturer/Location:	China
Sector/Group/Div.:	G&PS
Date submitted for test:	3/17/09
DUT Description:	LKP with channel knob 403-447MHz 4W 12.5/25kHz 16ch
Test TX mode(s):	CW
Max. Power output:	4.8 Watts
Nominal Power:	4.0 Watts
Tx Frequency Bands:	403-447 MHz
Signaling type:	FM
Model(s) Tested:	PMUE3325AAN
Model(s) Certified:	PMUE3325AAN
Serial Number(s):	1338KD0676, 1338KD0674
Classification:	Occupational/Controlled
Rule Part(s):	90

DUT Photo
(Refer to Exhibit 7B)

Approved Accessories:
Antenna(s):
NAE6483AR (403-520MHz, Whip, ¼ wave antenna, 0.0dBi); PMAE4016A (403-520MHz, Whip, ¼ wave antenna, 1.0dBi); PMAE4002A (403-433MHz, Stubby, ¼ wave antenna, -4.5dBi); PMAE4003A (430-470MHz, Stubby, ¼ wave antenna, -4.5dBi); PMAE4014A (403-425MHz, Whip, ¼ wave antenna, 1.0dBi).

Battery(ies):
PMNN4080A (LiIon High Capacity 2150mAH); PMNN4082B (NiMH-1300mAH); PMNN4081A (LiIon – 1500mAH)

Body worn accessory(ies):
HLN9844A (Spring Action Belt Clip – 2 inch); PMLN5334A (Protective Leather Case).

Audio/Data cable accessory(ies):
See section 3.0 for list of approved audio accessories.

Max. Calc. : 1-g Avg. SAR: 4.99 W/kg (Body); 10-g Avg. SAR: 3.58 W/kg (Body)
Max. Calc. : 1-g Avg. SAR: 4.00 W/kg (Face); 10-g Avg. SAR: 2.96 W/kg (Face)

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of 8W/kg per the requirements of 47 CFR 2.1093(d).
The test results clearly demonstrate compliance with ICNIRP (1998) Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300GHz), Health Physics 74, 494-522 RF Exposure limits of 10W/kg averaged over 10grams of contiguous tissue.

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.

Signature on file – Deanna Zakharia
Deanna Zakharia G&PS EME Lab Senior Resource Manager, Laboratory Director

Approval Date: 4/14/2009

Certification Date: 4/14/2009

Certification No.: L1090404

Part 1of 3

APPENDICES

Part 2 of 3

Part 3 of 3

Report Revision History

Date	Revision	Comments
4/14/09	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 number PMUE3325AAN FCC ID: AZ489FT4885. The results herein reflect final pilot 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 Radio communications (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”
- Draft of IEC62209-2 Ed.1: Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices – Human models, Instrumentation, and Procedures Part 2: Procedure to determine the specific absorption rate (SAR) for mobile wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz), revised on Oct 3, 2008.

* The IEC62209-1 and IEEE1528 are applicable for hand-held devices used in close proximity to the ear only.

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: AZ489FT4885, operates using frequency modulation (FM) incorporating traditional simplex two-way radio transmission protocol. The radio model PMUE3325AAN utilizes removable antennas and is capable of transmitting in the 403-447 MHz band. The nominal output power is 4.0 Watts with maximum output powers of 4.8 Watts as defined by upper limit of the production line final test station. The intended operating positions are “at the face” with front of the DUT at 1 to 2 inches from the mouth, and “at the body” by means of the offered body-worn accessories. Body-worn audio and PTT operation is accomplished by means of optional remote accessories that connect to the radio.

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

FCC ID: AZ489FT4885 is offered with the options and accessories listed below.
Audio Accessories:

PMLN4442A	Earbud with In-Line Mic/PTT/VOX Switch (MagOne)
PMLN4443A	Ear Receiver with In-Line Mic/PTT/VOX Switch (MagOne)
PMLN4444A	Earset with Boom Microphone and In-Line PTT/VOX Switch (MagOne)
PMLN4445A	Ultra-Light Headset with Boom Microphone and In-Line PTT/VOX Switch (MagOne)
PMMN4008A	Remote Speaker Microphone (MagOne)
HMN9013B	Lightweight Single Muff Adjustable Headset with Swivel Boom Microphone
HMN9754D	2 - wire Earpiece with Microphone and PTT Combined - Beige
PMLN4606A	2 - wire earpiece with clear acoustic tube (consisting of PMLN4605A & PMLN4294D)
PMLN5003A	Retail Temple Transducer Headset
PMMN4001A	Earset with Microphone and PTT
PMMN4029A	Remote Speaker Microphone with IP57 Rating
PMMN4013A	Remote Speaker Microphone with Ear Jack
RLN4941A	Receive only Earpiece with Translucent Tube (for PMMN4013A Remote Speaker Microphone)

AARLN4885B	Receive only Earbud (for PMMN4013A Remote Speaker Microphone)
WADN4190B	Receive only Flexible Earpiece (for PMMN4013A Remote Speaker Microphone)
PMLN4620A	Receive only D-Style Earpiece (for PMMN4013A Remote Speaker Microphone)
PMLN5001A	D-style Earpiece with Mic/PTT
RLN6230A	High Noise kit, Black (Includes Foam Earplugs with Acoustic Tube)
RLN6231A	High Noise kit, Beige (Includes Foam Earplugs with Acoustic Tube)
RLN6232A	Low Noise kit, Black (Includes Rubber Tips with Acoustic Tube)
RLN6241A	Low Noise kit, Beige (Includes Rubber Tips with Acoustic Tube)
RLN6242A	Quick Disconnect Acoustic Tube
RLN5317A	2-wire Earpiece with Microphone and PTT combined, translucent tube – Beige
RLN5318A	2-wire Earpiece with Microphone and PTT combined, translucent tube – Black
RLN4895A	2-wire Earpiece with Microphone and PTT combined – Black

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 71 manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The test system consists of a Stäubli RX90L robot, DAE4, and ES3DV3 E-field probe. 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 Rectangular Flat Phantom

Not Applicable

4.2.2 SAM Phantom

Not Applicable

4.2.3 Elliptical Flat Phantom

Phantom ID	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support structure material	Loss Tangent (wood)
ELI4 1037	300MHz -6GHz; Er = 4+/- 1, Loss Tangent = <0.05	600x400x190	2mm +/- 0.2mm	Wood	< 0.05
ELI4 1050	300MHz -6GHz; Er = 4+/- 1, Loss Tangent = <0.05	600x400x190	2mm +/- 0.2mm	Wood	< 0.05

4.3 Description of Equivalent tissues

Type of Simulated Tissue

The simulated tissue used is compliant to that specified in FCC Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) and IEEE 1528, 2003 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques". The simulated tissue used is also compliant to that specified in IEC62209-1 (2005) and adopted by CENELEC as EN62209-1 (2006).

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
Diacetin	NA	NA
De ionized -Water	39.1	50.53
Salt	3.8	1.87
HEC	1.0	1.0
Bact.	0.1	0.1

Reference section 6.1 for target parameters

5.0 Additional Test Equipment

Equipment Type	Model Number	Serial Number	Calibration Due Date
Power Meter	E4418B	MY45101014	8/26/2009
Power Sensor	8481B	MY41091170	9/2/2009
Power Meter	E4418B	MY45100532	10/15/2009
Power Sensor	8481B	SG41090248	9/2/2009
Power Meter	E4418B	MY45100911	5/28/2009
Power Sensor	8481B	SG41090258	5/28/2009
Signal Generator	E4438C	MY45091014	8/26/2010
Amplifier	10W1000C	312858	CNR
NARDA Bi-Directional Coupler	3020A	41935	9/23/2009
Thermometer	HH806AU	080307	7/19/2009
Temperature probe	80PK-22	9135	5/22/2009
Dickson Temp & RH Data Logger	TM320	06153216	5/16/2009
Network Analyzer (HP)	E5071B	MY42403147	8/26/2010
Dielectric Probe Kit (HP)	85070E	MY44300183	CNR
Speag Dipole	D450V3	1054	12/15/2009

6.0 SAR Measurement System Verification

The SAR measurements were conducted with probe model/serial number ES3DV3/SN3096. 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 using head tissue equivalent medium 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.

Tissue Target Tolerances

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Di-electric Constant Target	Conductivity Meas. (S/m)	Di-electric Constant Meas.	Tested Date
450	FCC Body	0.94	56.7	0.94	55.5	3/19/09
				0.94	55.5	3/20/09
				0.93	55.1	3/23/09
				0.93	55.2	3/25/09
450	IEEE/ IEC Head	0.87	43.5	0.86	43.8	3/24/09
425	FCC Body	0.94	57.0	0.92	55.9	3/19/09
				0.92	55.9	3/20/09
				0.91	55.5	3/23/09
				0.91	55.4	3/24/09
				0.91	55.6	3/25/09
425	IEEE/ IEC Head	0.87	43.8	0.84	44.6	3/23/09
				0.84	44.4	3/24/09

6.2 System Check Test Results

Probe Serial #	Tissue Type	Probe Cal Date	Dipole Kit / Serial #	Reference SAR @ 1W (mW/g)	System Check Test Results when normalized to 1W (mW/g)	Tested Date
3096	FCC Body	12/18/08	SPEAG D450V3 /1054	4.20 +/- 10%	4.12	3/19/09
					4.20	3/20/09
					4.04	3/23/09
					4.12	3/25/09
3096	IEEE/ IEC Head	12/18/08	SPEAG D450V3 /1054	4.36 +/- 10%	4.36	3/24/09

Note: See APPENDIX D for an explanation of the reference SAR targets stated above.

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 ISO/IEC 17025 A2LA guidelines.

7.0 DUT Test Strategy and Methodology

7.1 DUT Configuration(s)

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

Test Plan

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

Note that full DASY4™ coarse and 5x5x7 zoom scans methodology was utilized to determine the worst-case SAR performance configuration for each applicable body location.

The One Factor at A Time (OFAT) method was applied to develop the SAR test plan for this product. The following test sequences for each of the body test positions were applied:

Assessments at the Body with body-worn accessories (CW mode)

- **Assessment of the offered antennas (table 1, page 14):** the highest capacity battery PMNN4080A, the standard body-worn accessory HLN9844A belt clip, and the standard audio cable PMMN4008A (RSM) were selected to perform the testing for each of the offered antennas at their respective center frequencies per frequency range. The test configuration with the highest Max Calc. 1g-SAR result for this section is with the antenna PMAE4003A. Further, the peak SAR is located at the similar location for each of the tested antennas as indicated in Appendix J (1.0 SAR Plots for the Antenna assessment at the Body); therefore, antenna PMAE4003A was selected to perform the battery search.

- **Assessment of the offered batteries (table 2, page 14)**: the highest SAR antenna (PMAE4003A) was used to assess all other batteries. The battery that provided highest Max Calc. 1g-SAR result was with the thinnest battery PMNN4081A. The peak SAR is located at the similar location for each of the tested batteries as indicated in Appendix J (2.0 SAR Plots for Battery assessment at the Body).

- **Assessment of the offered body-worn accessories (table 3, Page 14):** the overall highest test configuration from the assessment of the antenna and battery sections above (battery PMNN4081A and antenna PMAE4003A) was selected to assess the leather case

PMLN5334A along with belt clip HLN9844A. This leather case is intended to be used together with belt clip HLN9844A. The peak SAR is located at the similar location for both test configurations of the Body-worn as indicated in Appendix J (3.0 SAR Plots for Body-worn accessory search), and the body-worn accessory providing the highest Max Calc. 1g-SAR still remain with belt clip HLN9844A only.

- **Assessment of the offered audio accessories (table 4, Page 15):** the overall highest test configuration from the assessment of the antenna, battery and body-worn accessory sections above (battery PMNN4081A, antenna PMAE4003A, and clip HLN9844A) was selected to evaluate all the other 14 audio accessories that listed in section 3.0 of the report. The peak SAR is located at the similar location for each of the audio accessories as indicated in Appendix J (4.0 SAR Plots for Audio accessory assessment at the Body).

  Note1: The audio accessory PMLN4442A is done by similarity to the audio accessory PMLN4443A since both of them have the same physical cable length and thickness, the only difference being the earpiece attached at the end of the cable.

  Note2: The audio accessories PMLN4620A, AARLN4885B, WADN4190B and RLN4941A are receive only earpiece cables, and these cables are used in conjunction with the Remote Speaker Microphone PMMN4013A. The audio accessories AARLN4885B and RLN4941A were tested with the RSM PMMN4013A and the Max Calc. 1g-SAR results for the AARLN4885B and RLN4941A are identical. Therefore, the PMLN4620A and WADN4190B were done by similarity to the AARLN4885B.

  Note3: The audio accessories RLN6230A, RLN6231A, RLN6232A, RLN6241A, and RLN6242A are the acoustic tubes that are used individually in conjunction with the audio accessory HMN9754D. The audio accessory RLN6230A was tested with the audio accessory HMN9754D. The RLN6231A, RLN6232A, RLN6241A, and RLN6242A were not tested due to their similar physical materials and construction as the RLN6230A.

  Note4: The audio accessories RLN5317A, RLN5318A and RLN4895A are done by similarity to the audio accessory HMN9754D, all of them have the same physical cable length and thickness, the only difference being the earpiece attached at the end of the cable.

- **Assessment across the frequency bands for each of the offered antennas (table 5, page 16):** Since the peak SAR locations of the device are similar for all the audio accessories, the overall highest test configuration (battery PMNN4081A, belt clip HLN9844A, and audio PMMN4001A) was selected to assess at the low, middle and high frequencies for each of the offered antennas.

<u>Assessments at the Body without the body-worn accessories and at 2.5cm (table 6, page 16 & 17)</u>

- All the offered antennas were grouped by type and only the test configuration (antenna, frequency and audio cable) that indicated the highest SAR result for each group was selected to assess this device at 2.5cm with the front and back of the device facing the phantom. The following is the grouping of the antennas:

- Antennas NAE6483AR, PMAE4016A and PMAE4014A are Whip antennas, antenna PAME4016A, which produced the highest Max Calc. 1g-SAR, was selected for evaluation at the 2.5cm.

- Antenna PMAE4002A and PMAE4003A are Stubby antennas, antenna PMAE4003A, which produced the highest Max Calc. 1g-SAR, was selected for evaluation at the 2.5cm.

  Note: The 2.5cm assessments included the following configurations:

  - Back of the device facing the phantom, positioned at 2.5cm from the phantom surface. Results for this test configuration are not included in the report since the peak SAR is located on the antenna, and the SAR result for this configuration is lower than the SAR results when tested with antenna at 2.5cm from the phantom surface.
  - Back of the device facing the phantom, the antenna at 2.5cm from the phantom surface.
  - Front of the device facing the phantom, at 2.5cm from the phantom surface.

- The highest SAR configuration from the 2.5cm assessment will be assessed for antennas NAE6483AR, PMAE4014A and PMAE4002A.

<u>Assessments at the Face:</u>

- **Assessment of the offered antennas (table 7, page 17):** the worst case battery PMNN4081A determined in the Body assessment was selected to perform the testing for each of the offered antennas at their respective center frequencies per range.

- **Assessment of the offered batteries (table 8, page 17):** the highest test configuration from the Antenna assessment featuring the highest SAR was selected to assess other batteries.

- **Assessment across the frequency bands for each of the offered antennas (table 9, page 18):** The results of the Max Calc. SAR for all the batteries when compared to the same test frequency and antenna are similar. The battery with the highest Max Calc. SAR was selected to assess at the low, middle and high frequencies for each of the offered antennas.

<u>Shortened scan assessment</u> (table 10, page 18)

- A "shortened" scan was performed, using the offered battery and test configuration that produced the highest SAR results overall (in bold with *), to validate the SAR drift of the full DASY4™ coarse and 5x5x7 zoom scans. Note that the shortened scan represents the zoom scan performance result; this is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, a 5x5x7 zoom scan only was performed.

7.2 Device Positioning Procedures

Reference Appendix G for photos of the DUT tested positions.

7.2.1 Body

The DUT was positioned in normal use configuration against the phantom with the offered body worn accessory.
The DUT was positioned with its' front side separated 2.5cm and the back side with antenna separated 2.5cm from the phantom.

7.2.2 Head

Not applicable.

7.2.3 Face

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

8.0 Environmental Test Conditions

The EME Laboratory ambient environment is well controlled resulting in very stable simulated tissue temperature and therefore stable dielectric properties. Simulated tissue temperature is measured prior to each scan to insure it is within +/ - 2^{o}C of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was at least 15cm. 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	18 - 25 ˚C	Range: 22.3-22.9˚C Avg. 22.63˚C
Relative Humidity	30 - 70 %	Range: 49.5-61.6% Avg. 54.99%
Tissue Temperature	NA	Range: 21.5-22.0˚C Avg. 21.8˚C

The EME Lab RF environment uses a Spectrum Analyzer to monitor for extraneous large signal RF contaminants that could possibly affect the test results. If such unwanted signals are discovered the 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, the full DASY4^{TM} coarse and 5x5x7 zoom methodology, was utilized to ascertain the worst case test configuration for each body location in the band. The associated SAR plots are provided in Appendix E. Appendix E also presents a shortened SAR cube scan to assess the validity of the calculated results presented herein.

Note: The results of the shortened cube scan presented in Appendix E demonstrate that the scaling methodology used to determine the calculated SAR results presented herein are valid.

9.1 SAR results scaling methodology

The calculated 1-gram and 10-gram averaged SAR results indicated as "Max Calc. 1g-SAR" and "Max Calc.10g-SAR" in the following data tables are determined by scaling the measured SAR to account for power leveling variations and power slump. For this device the "Max Calc. 1g-SAR" and "Max Calc.10g-SAR" are scaled using the following formula:

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

P_{max} = Maximum Power (W)

P_{int} = Initial Power (W);

Pdrift = DASY drift results (dB);

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

DC % = Transmission mode duty cycle in % where applicable

50% duty cycle is applied for PTT operation.

Note: for conservative results, the following are applied:

If Pint > Pmax, then Pmax/Pint = 1.

If Pdrift is positive, then 10^(Pdrift/10) = 1.

Table 1

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)
Assessments at Body – Assessment of offered antennas												
CcC(PS)-AB-090319-07 / 1338KD0676	NAE6483AR	425.000	PMNN4080A	Against phantom	HLN9844A	PMMN4008A	4.790	-0.484	2.810	2.040	1.57	1.14
CcC(PS)-AB-090319-08 / 1338KD0676	PMAE4016A	425.000	PMNN4080A	Against phantom	HLN9844A	PMMN4008A	4.760	-0.477	2.720	1.970	1.53	1.11
CcC(PS)-AB-090319-09 / 1338KD0676	PMAE4014A	414.000	PMNN4080A	Against phantom	HLN9844A	PMMN4008A	4.780	-0.408	1.570	1.140	0.87	0.63
CcC(PS)-AB-090319-10 / 1338KD0676	PMAE4002A	418.000	PMNN4080A	Against phantom	HLN9844A	PMMN4008A	4.860	-0.470	3.600	2.600	2.01	1.45
CcC(PS)-AB-090319-06 / 1338KD0676	PMAE4003A	438.500	PMNN4080A	Against phantom	HLN9844A	PMMN4008A	4.700	-0.509	3.800	2.750	2.18	1.58

Table 2

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)
Assessments at Body – Assessment of offered batteries												
CcC(PS)-AB-090319-06 / 1338KD0676	PMAE4003A	438.500	PMNN4080A	Against phantom	HLN9844A	PMMN4008A	4.700	-0.509	3.800	2.750	2.18	1.58
CcC(PS)-AB-090319-11 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4008A	4.690	-0.491	4.600	3.250	2.64	1.86
Vee-AB-090319-12 / 1338KD0676	PMAE4003A	438.500	PMNN4082B	Against phantom	HLN9844A	PMMN4008A	4.720	-0.61	3.930	2.830	2.30	1.66

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)
Assessments at Body – Assessment of offered Body-worn accessories												
CcC(PS)-AB-090319-11 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4008A	4.690	-0.491	4.600	3.250	2.64	1.86
Vee-AB-090319-13 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	PMLN5334A Leather case tested w/ HLN9844A	PMMN4008A	4.680	-0.431	4.570	3.240	2.59	1.83

Table 4

Assessments at Body – Assessment of offered Audio accessories												
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)**
CcC(PS)-AB-090319-11 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4008A	4.690	-0.491	4.600	3.250	2.64	1.86
Vee-AB-090319-14 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4013A	4.760	-0.484	4.140	2.930	2.33	1.65
Vee-AB-090319-15 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4013A RSM w/AARLN4885B	4.700	-0.461	4.220	2.970	2.40	1.69
Vee-AB-090319-16 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4013A RSM w/RLN4941A	4.620	-0.486	4.070	2.870	2.36	1.67
Vee-AB-090319-17 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4029A	4.730	-0.438	4.120	2.900	2.31	1.63
Vee-AB-090319-18 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMLN4443A	4.730	-0.461	4.440	3.150	2.51	1.78
Vee-AB-090319-19 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMLN4444A	4.740	-0.494	4.940	3.510	2.80	1.99
Vee-AB-090319-20 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMLN4445A	4.700	-0.501	4.370	3.100	2.50	1.78
Vee-AB-090319-21 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMLN4606A	4.720	-0.453	3.740	2.650	2.11	1.50
Vee-AB-090319-22 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.730	-0.445	5.020	3.570	2.82	2.01
Vee-AB-090319-23 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMLN5001A	4.690	-0.297	4.390	3.110	2.41	1.70
Vee-AB-090319-24 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMLN5003A	4.700	-0.465	4.020	2.830	2.28	1.61
CcC(PS)-AB-090320-02 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	HMN9013B.	4.680	-0.480	4.510	3.190	2.58	1.83
CcC(PS)-AB-090320-03 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	HMN9754D	4.650	-0.500	4.510	3.190	2.61	1.85
CcC(PS)-AB-090320-04 / 1338KD0676	PMAE4003A	438.50	PMNN4081A	Against phantom	HLN9844A	HMN9754D w/RLN6230A	4.670	-0.519	4.200	3.010	2.43	1.74

Table 5

Assessments at Body -Assessment across frequencies band for each of the offered antennas												
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)**
CcC(PS)-AB-090320-05 / 1338KD0676	NAE6483AR	403.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.490	-0.438	4.740	3.410	2.80	2.02
CcC(PS)-AB-090320-06 / 1338KD0676	NAE6483AR	425.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.580	-0.627	3.390	2.430	2.05	1.47
CcC(PS)-AB-090320-07 / 1338KD0676	NAE6483AR	447.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.730	-0.281	3.870	2.770	2.09	1.50
CcC(PS)-AB-090320-08 / 1338KD0676	PMAE4016A	403.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.460	-0.564	4.620	3.350	2.83	2.05
CcC(PS)-AB-090320-09 / 1338KD0676	PMAE4016A	425.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.640	-0.569	3.420	2.450	2.02	1.44
CcC(PS)-AB-090320-10 / 1338KD0676	PMAE4016A	447.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.860	-0.400	3.810	2.700	2.09	1.48
CcC(PS)-AB-090320-11 / 1338KD0676	PMAE4014A	403.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.500	-0.629	2.860	2.070	1.76	1.28
Vee-AB-090320-12 / 1338KD0676	PMAE4014A	414.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.650	-0.585	2.060	1.490	1.22	0.88
Vee-AB-090320-13 / 1338KD0676	PMAE4014A	425.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.640	-0.340	1.390	1.000	0.78	0.56
Vee-AB-090320-14 / 1338KD0676	PMAE4002A	403.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.430	-0.0533	3.290	2.350	1.80	1.29
Vee-AB-090320-15 / 1338KD0676	PMAE4002A	418.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.650	-0.727	4.240	3.020	2.59	1.84
Vee-AB-090320-16 / 1338KD0676	PMAE4002A	433.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.700	-0.558	4.180	2.950	2.43	1.71
Vee-AB-090320-17 / 1338KD0676	PMAE4003A	430.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.620	-0.293	4.210	2.980	2.34	1.66
Vee-AB-090320-18 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.660	-0.392	5.130	3.650	2.89	2.06
Vee-AB-090320-19 / 1338KD0676	PMAE4003A	447.000	PMNN4081A	Against phantom	HLN9844A	PMMN4001A	4.810	-0.479	5.780	4.090	3.23	2.28

Table 6

Assessments at Body – Assessment at 2.5cm												
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)**
Vee-AB-090320-20 / 1338KD0676	PMAE4016A	403.0000	PMNN4081A	DUT Back - Antenna at 2.5cm	None	PMMN4001A	4.510	-0.443	8.010	5.850	4.72	3.45
Vee-AB-090320-22 / 1338KD0676	PMAE4016A	403.0000	PMNN4081A	DUT Front - radio at 2.5cm	None	PMMN4001A	4.490	-0.575	5.650	4.170	3.45	2.54
Vee-AB-090320-23 / 1338KD0676	PMAE4003A	447.0000	PMNN4081A	DUT Back - Antenna at 2.5cm	None	PMMN4001A	4.800	-0.488	8.460	6.040	4.73	3.38
***Vee(PS)-AB-090323-04 / 1338KD0674**	**PMAE4003A**	**447.0000**	**PMNN4081A**	**DUT Back - Antenna at 2.5cm**	**None**	**PMMN4001A**	**4.850**	**-0.455**	**8.98**	**6.45**	**4.99**	**3.58**
Vee(PS)-AB-090323-03 / 1338KD0676	PMAE4003A	447.0000	PMNN4081A	DUT Front - radio at 2.5cm	None	PMMN4001A	4.830	-0.452	4.710	3.450	2.61	1.91

Table 6 (Continued)

Assessments at Body – Assessment at 2.5cm												
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)
CcC(PS)-AB-090325-02 / 1338KD0676	NAE6483AR	403.0000	PMNN4081A	DUT Back - Antenna at 2.5cm	None	PMMN4001A	4.570	-0.573	7.380	5.380	4.42	3.22
CcC(PS)-AB-090325-04 / 1338KD0676	PMAE4014A	403.0000	PMNN4081A	DUT Back - Antenna at 2.5cm	None	PMMN4001A	4.560	-0.550	4.880	3.570	2.92	2.13
CcC(PS)-AB-090325-06 / 1338KD0676	PMAE4002A	418.0000	PMNN4081A	DUT Back - Antenna at 2.5cm	None,	PMMN4001A	4.640	-0.520	7.450	5.340	4.34	3.11

Table 7

Assessments at Face – Assessment of offered antennas												
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)
Vee(PS)-FACE-090323-05 / 1338KD0676	NAE6483AR	425.000	PMNN4081A	Front 2.5cm	None	None	4.620	-0.526	4.540	3.340	2.66	1.96
Vee(PS)-FACE-090323-06 / 1338KD0676	PMAE4016A	425.000	PMNN4081A	Front 2.5cm	None	None	4.690	-0.409	4.670	3.430	2.63	1.93
Vee(PS)-FACE-090323-07 / 1338KD0676	PMAE4014A	414.000	PMNN4081A	Front 2.5cm	None	None	4.580	-0.345	2.950	2.180	1.67	1.24
Vee(PS)-FACE-090323-08 / 1338KD0676	PMAE4002A	418.000	PMNN4081A	Front 2.5cm	None	None	4.670	-0.550	5.640	4.160	3.29	2.43
Vee(PS)-FACE-090323-09 / 1338KD0676	PMAE4003A	438.500	PMNN4081A	Front 2.5cm	None	None	4.740	-0.550	5.630	4.140	3.24	2.38

Table 8

Assessments at Face – Assessment of offered batteries												
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)
Vee(PS)-FACE-090323-08 / 1338KD0676	PMAE4002A	418.000	PMNN4081A	Front 2.5cm	None	None	4.670	-0.550	5.640	4.160	3.29	2.43
Vee(PS)-FACE-090323-10 / 1338KD0676	PMAE4002A	418.000	PMNN4080A	Front 2.5cm	None	None	4.800	-0.539	5.860	4.320	3.32	2.45
Vee(PS)-FACE-090323-11 / 1338KD0676	PMAE4002A	418.000	PMNN4082B	Front 2.5cm	None	None	4.800	-0.614	5.070	3.750	2.92	2.16

Table 9

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)
Assessments at Face -Assessment across frequencies band for each of the offered antennas												
CcC-FACE-090323-12 / 1338KD0676	NAE6483AR	403.000	PMNN4080A	Front 2.5cm	None	None	4.930	-0.612	6.710	4.960	3.86	2.86
CcC-FACE-090323-13 / 1338KD0676	NAE6483AR	425.000	PMNN4080A	Front 2.5cm	None	None	4.960	-0.610	4.670	3.440	2.69	1.98
CcC-FACE-090323-14 / 1338KD0676	NAE6483AR	447.000	PMNN4080A	Front 2.5cm	None	None	4.990	-0.464	4.690	3.440	2.61	1.91
CcC-FACE-090323-15 / 1338KD0676	PMAE4016A	403.000	PMNN4080A	Front 2.5cm	None	None	4.730	-0.613	6.650	4.920	3.89	2.87
Vee(PS)-FACE-090324-05 / 1338KD0674	PMAE4016A	403.000	PMNN4080A	Front 2.5cm	None	None	4.490	-0.577	6.560	4.850	4.00	2.96
CcC-FACE-090323-16 / 1338KD0676	PMAE4016A	425.000	PMNN4080A	Front 2.5cm	None	None	4.760	-0.516	4.560	3.370	2.59	1.91
CcC-FACE-090323-17 / 1338KD0676	PMAE4016A	447.000	PMNN4080A	Front 2.5cm	None	None	4.900	-0.441	4.650	3.410	2.57	1.89
CcC-FACE-090323-18 / 1338KD0676	PMAE4003A	430.000	PMNN4080A	Front 2.5cm	None	None	4.890	-0.477	4.920	3.620	2.75	2.02
CcC-FACE-090323-19 / 1338KD0676	PMAE4003A	438.500	PMNN4080A	Front 2.5cm	None	None	4.800	-0.568	5.630	4.140	3.21	2.36
CcC-FACE-090323-20 / 1338KD0676	PMAE4003A	447.000	PMNN4080A	Front 2.5cm	None	None	4.940	-0.595	6.090	4.480	3.49	2.57
CcC-FACE-090323-21 / 1338KD0676	PMAE4014A	403.000	PMNN4080A	Front 2.5cm	None	None	4.850	-0.639	4.370	3.240	2.53	1.88
CcC-FACE-090323-22 / 1338KD0676	PMAE4014A	414.000	PMNN4080A	Front 2.5cm	None	None	4.920	-0.542	3.070	2.270	1.74	1.29
CcC-FACE-090323-23 / 1338KD0676	PMAE4014A	425.000	PMNN4080A	Front 2.5cm	None	None	4.820	-0.344	2.260	1.670	1.22	0.90
Vee(PS)-FACE-090324-02 / 1338KD0676	PMAE4002A	403.000	PMNN4080A	Front 2.5cm	None	None	4.680	-0.0023	4.570	3.380	2.34	1.73
Vee(PS)-FACE-090324-03 / 1338KD0676	PMAE4002A	418.000	PMNN4080A	Front 2.5cm	None	None	4.880	-0.561	5.860	4.330	3.33	2.46
Vee(PS)-FACE-090324-04 / 1338KD0676	PMAE4002A	433.000	PMNN4080A	Front 2.5cm	None	None	4.770	-0.621	4.970	3.650	2.89	2.12

Table 10

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)
Shorten Scan												
Shorten Scan CcC-AB-090324-14 / 1338KD0674	PMAE4003A	447.000	PMNN4081A	DUT Back - Antenna at 2.5cm	None	PMMN4001A	4.760	-0.349	8.620	6.160	4.71	3.37

10.0 Conclusion

The highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for FCC ID: AZ489FT4885 model PMUE3325AAN.

Max. Calc. : 1-g Avg. SAR: 4.99 W/kg (Body); 10-g Avg. SAR: 3.58 W/kg (Body)
Max. Calc. : 1-g Avg. SAR: 4.00 W/kg (Face); 10-g Avg. SAR: 2.96 W/kg (Face)

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8 W/kg** per the requirements of 47 CFR 2.1093(d).

Appendix A
Measurement Uncertainty

The Measurement Uncertainty tables indicated in this Appendix are applicable to the DUT and Dipole test frequency is ranging from 100MHz to 3GHz, and for Dipole test frequency is ranging from 300MHz to 3GHz. Therefore, the highest tolerance for the probe calibration uncertainty is indicated.

Table 1 : Uncertainty Budget for Device Under Test, for 100MHz to 800 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h =* *c x f / e*	*i =* *c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob Dist**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	10.0	N	1.00	1	1	10.0	10.0	∞
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				14	13	965
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				27	27	

Table 2: Uncertainty Budget for System Validation (dipole & flat phantom) for 300MHz to 800 MHz

a	b	c	d	e = f(d,k)	f	g	h = c x f / e	i = c x g / e	k
Uncertainty Component	IEEE 1528 section	**Tol.** (± %)	**Prob. Dist.**	**Div.**	c_i (1 g)	c_i (10 g)	**1 g** u_i (±%)	**10 g** u_i (±%)	v_i
Measurement System									
Probe Calibration	E.2.1	9.0	N	1.00	1	1	9.0	9.0	∞
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				11	11	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				22	22	

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

Appendix B
Probe Calibration Certificates

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

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

Accredited by the Swiss Accreditation Service (SAS)
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 MY (Precision)**

Certificate No: **ES3-3096_Dec08**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3096
Calibration procedure(s)	QA CAL-01.v6, QA CAL-12.v5, QA CAL-14.v3 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	December 18, 2008
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 (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

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

Issued: December 18, 2008

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

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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) 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:

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

Probe ES3DV3

SN:3096

Manufactured:	July 12, 2005
Last calibrated:	December 19, 2007
Recalibrated:	December 18, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3096

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

NormX	**1.23** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**91** mV
NormY	**1.08** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**91** mV
NormZ	**1.23** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**92** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	11.5	7.2
SAR_{be} [%]	With Correction Algorithm	0.8	0.4

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

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	10.6	5.7
SAR_{be} [%]	With Correction Algorithm	0.8	0.6

Sensor Offset

Probe Tip to Sensor Center **2.0** mm

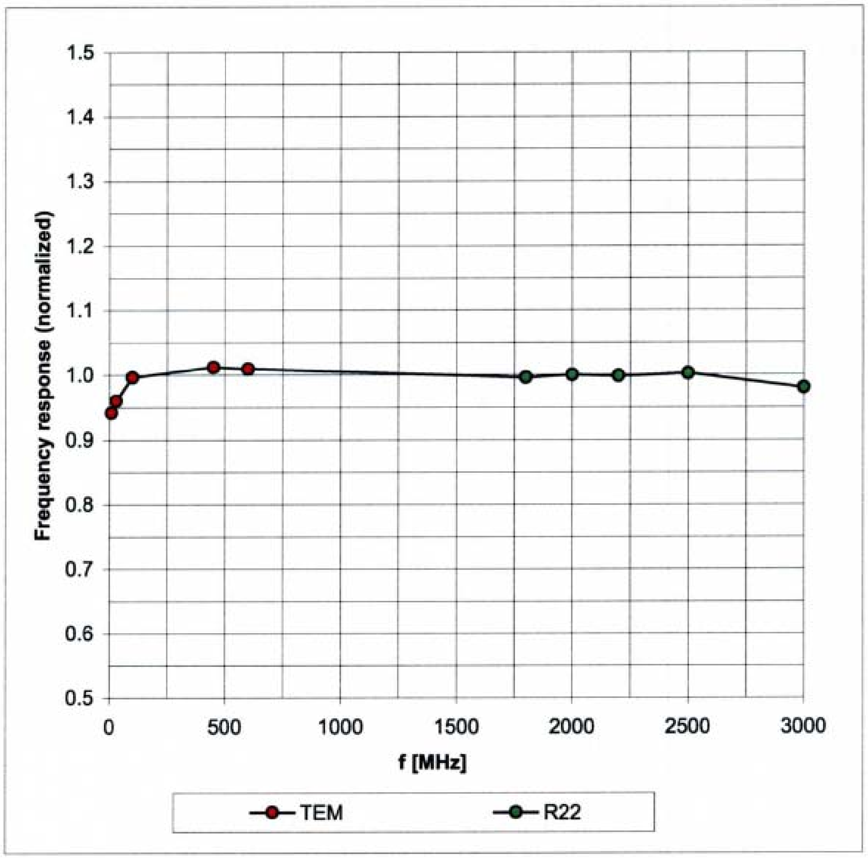
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

[B] Numerical linearization parameter: uncertainty not required.

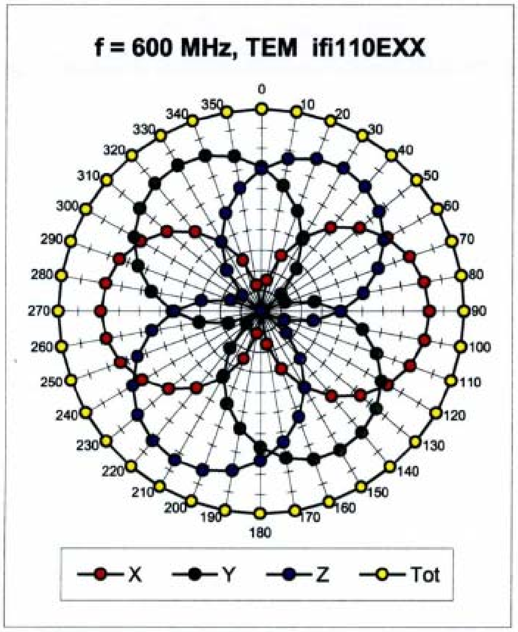
Frequency Response of E-Field

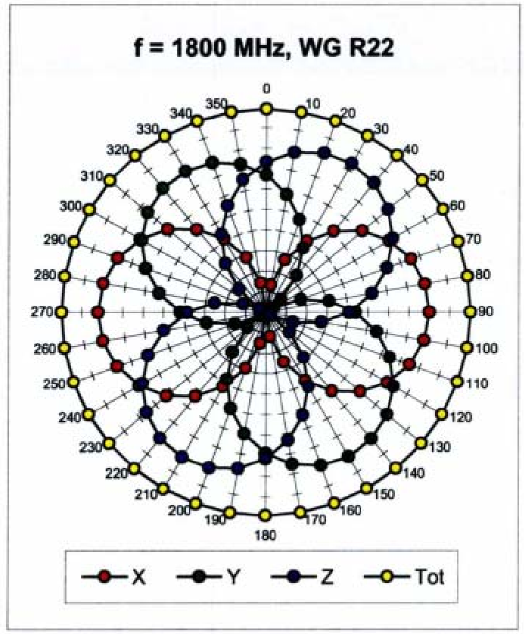
(TEM-Cell:ifi110 EXX, Waveguide: R22)

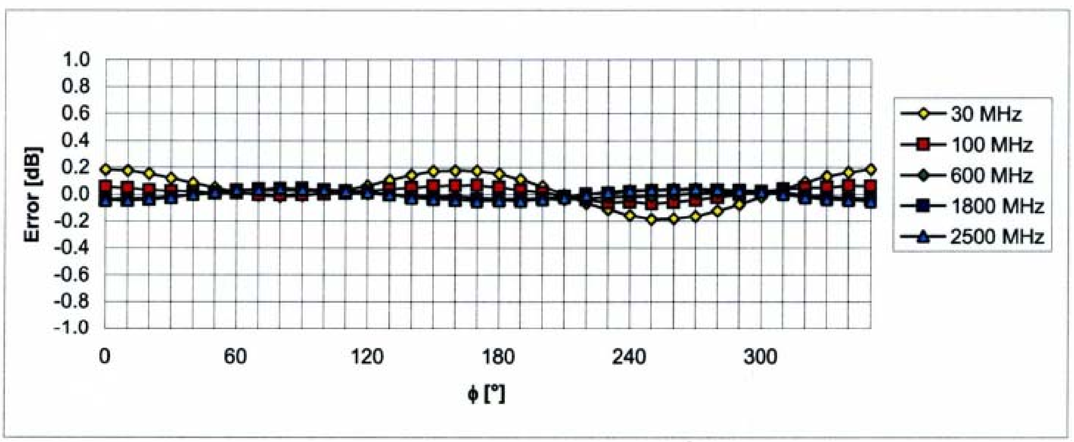


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



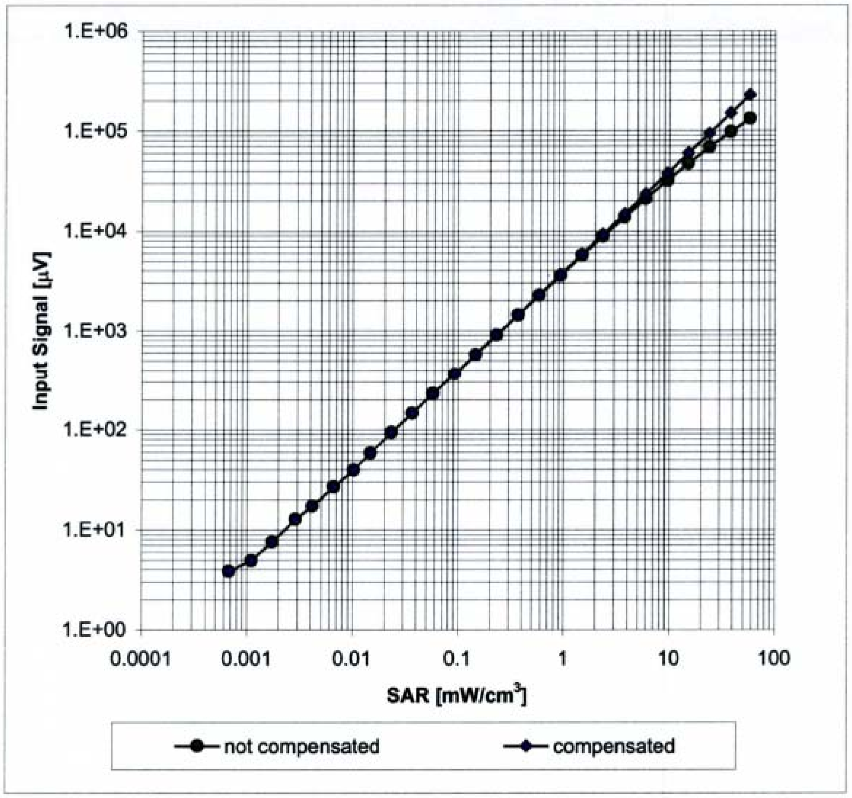


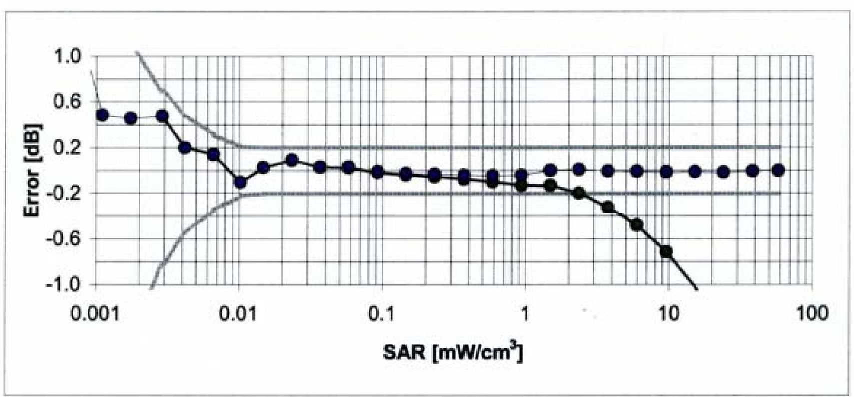


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

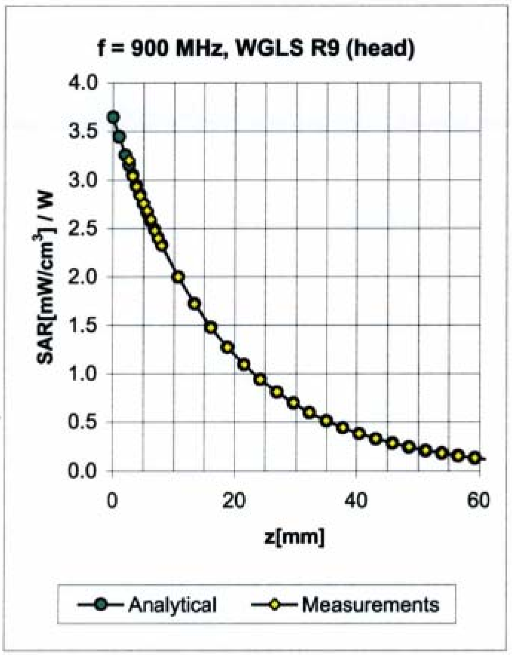
(Waveguide R22, f = 1800 MHz)

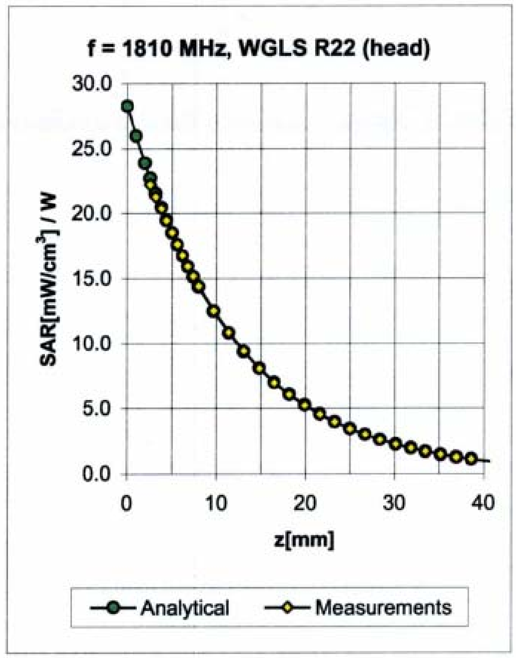




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



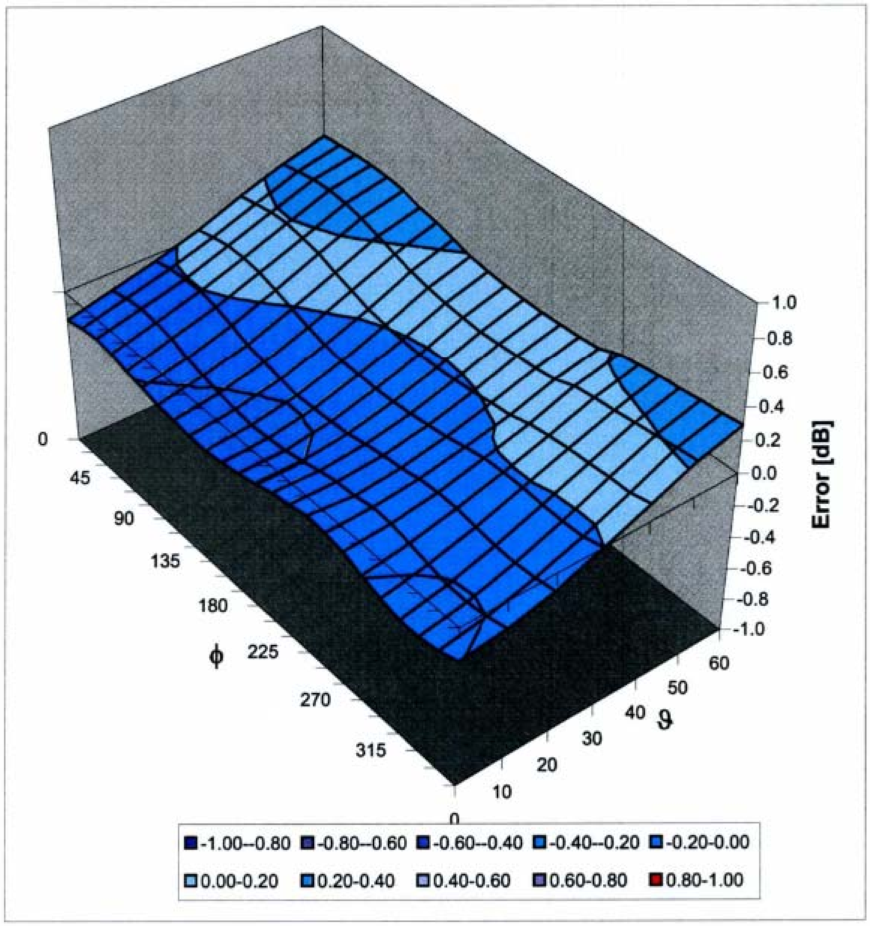


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.31	1.49	6.48	± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.26	2.40	5.61	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.56	1.43	4.84	± 11.0% (k=2)
2300	± 50 / ± 105	Head	39.4 ± 5%	1.71 ± 5%	0.60	1.50	4.59	± 11.0% (k=2)
2450	± 50 / ± 106	Head	39.2 ± 5%	1.80 ± 5%	0.58	1.45	4.41	± 11.0% (k=2)
2600	± 50 / ± 107	Head	39.0 ± 5%	1.96 ± 5%	0.47	1.64	4.34	± 11.0% (k=2)
3500	± 50 / ± 108	Head	37.9 ± 5%	2.91 ± 5%	0.90	1.20	3.91	± 13.1% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.24	1.27	6.97	± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.52	1.43	5.65	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.42	1.84	4.74	± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.49	1.79	4.22	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.56	1.72	4.04	± 11.0% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.59	1.90	3.90	± 11.0% (k=2)
3500	± 50 / ± 100	Body	51.3 ± 5%	3.31 ± 5%	0.99	1.25	3.58	± 13.1% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ES3DV3**
Serial Number:	**3096**
Place of Assessment:	**Zurich**
Date of Assessment:	**December 19, 2008**
Probe Calibration Date:	**December 18, 2008**

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:

Dosimetric E-Field Probe ES3DV3 SN:3096

Conversion factor (± standard deviation)

Frequency		Value	Tissue parameters
150 MHz	*ConvF*	**7.6 ± 10%**	ε_r = 52.3; σ = 0.76 mho/m (head tissue)
250 MHz	*ConvF*	**6.9 ± 10%**	ε_r = 47.6; σ = 0.83 mho/m (head tissue)
300 MHz	*ConvF*	**6.8 ± 9%**	ε_r = 45.3; σ = 0.87 mho/m (head tissue)
750 MHz	*ConvF*	**5.9 ± 7%**	ε_r = 41.9; σ = 0.89 mho/m (head tissue)
150 MHz	*ConvF*	**7.4 ± 10%**	ε_r = 61.9; σ = 0.80 mho/m (body tissue)
250 MHz	*ConvF*	**7.0 ± 10%**	ε_r = 59.4; σ = 0.88 mho/m (body tissue)
300 MHz	*ConvF*	**6.8 ± 9%**	ε_r = 58.2; σ = 0.92 mho/m (body tissue)
750 MHz	*ConvF*	**5.7 ± 7%**	ε_r = 55.5; σ = 0.96 mho/m (body tissue)

Important Note:

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

Please see also Section 4.7 of the DASY4 Manual.

ES3DV3-SN:3096 Page 2 of 2 December 19, 2008

Note: The standard deviation for each Conversion factor stated in above numerical assessments were taken at k = 1.