



**DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2**

**Motorola Solutions Inc.**  
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 131031

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**Date/s Tested:** 09/09/13-09/17/13  
**Manufacturer/Location:** Motorola, Penang  
**Sector/Group/Div.:** EMS  
**Date submitted for test:** 08/23/13  
**DUT Description:** Handheld Portable - Frequency band of 806-824MHz & 851-869MHz, 2.402-2.480GHz (Bluetooth), Non-GOB  
**Test TX mode(s):** TDMA (PTT); CW (Bluetooth)  
**Max. Power output:** 2.4W (800 band), 10.0mW (Bluetooth)  
**Nominal Power:** 2.0W(800 band), 2.5mW (Bluetooth)  
**Tx Frequency Bands:** 806-824MHz & 851-869MHz, 2.402-2.480GHz (Bluetooth)  
**Signaling type:** TDMA; FHSS (Bluetooth)  
**Model(s) Tested:** PMUF1630A  
**Model(s) Certified:** PMUF1630A  
**Serial Number(s):** 806TPR1014  
**Classification:** Occupational/Controlled  
**FCC ID:** AZ489FT5866; Rule Part 90 (806-824MHz, 851-869MHz)  
**IC ID:** 109U-89FT5866

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of 8 W/kg averaged over 1 gram per the requirements of 47 CFR 2.1093(d). The 10 grams result is not applicable to FCC filing. The test results clearly demonstrate compliance with ICNIRP (1998) Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), Health Physics 74, 494-522 RF Exposure limits of 10 W/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 3.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola Solutions Inc EME Laboratory. I attest to the accuracy of the data and assume full responsibility for the completeness of these measurements. This reporting format is consistent with the suggested guidelines of the TIA TSB-150 December 2004. The results and statements contained in this report pertain only to the device(s) evaluated.

*Deanna Zakharia*

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**Approval Date: 10/31/2013**

**Certification Date: 10/30/2013**

**Certification No.: L1131020**

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**Report Revision History**

Date	Revision	Comments
10/07/2013	O	Initial release
10/30/2013	A	BT power was updated on front cover pages and in sections 7.0, 13.6 & 14.0. SAR results for BT and simultaneous results were updated in sections 2.0 (Table 1), 13.6, 14.0, 15.0 (Table 28). BT antenna gain was updated in section 8.1 (Table 3).
10/31/2013	B	Part 1 of 2 only, updated simultaneous SAR 10g results in Tables 1 & 28.

## 1.0 Introduction

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (SAR) measurements performed at the Motorola Solutions Inc. EME Test Laboratory for handheld portable model number PMUF1630A. This device is classified as Occupational/Controlled.

## 2.0 SAR Summary

**TABLE 1**

Equipment Class	Frequency band (MHz)	Max Calc at Body (mW/g)		Max Calc at Face (mW/g)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
TNF	806-824	1.41	1.03	1.04	0.76
	851-869	0.87	0.61	0.65	0.48
DSS/DTS	2402-2480	NA	NA	NA	NA
Simultaneous Results		1.75	1.37	NA	NA

## 5.0 3.0 Abbreviations / Definitions

CNR: Calibration Not Required  
 EME: Electromagnetic Energy  
 CW: Continuous Wave  
 DUT: Device Under Test  
 BT: Bluetooth  
 FHSS: Frequency Hopping Spread Spectrum  
 FM: Frequency Modulation  
 NA: Not Applicable  
 PTT: Push to Talk  
 4FSK: 4 Level Frequency Shift Keying  
 TDMA: Time Division Multiple Access  
 EDR: Enhanced Data Rate  
 SAR: Specific Absorption Rate  
 GFSK: Gaussian Frequency-Shift Keying  
 DQPSK: Differential Quadrature Phase-Shift Keying  
 DPSK: Differential Phase-Shift Keying  
 DSP: Digital Signal Processor  
 GOB: Generic Option Board

Audio accessories: These accessories allow communication while the DUT is worn on the body.

Body worn accessories: These accessories allow the DUT to be worn on the body of the user.

Maximum Power: Defined as the upper limit of the production line final test station.

#### 4.0 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 Electronics Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2005
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6 (2009), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- 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 9 kHz and 300 GHz." and “Attachment to resolution # 303 from July 2, 2002”
- IEC62209-2 Edition 1.0 2010-03, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz).

(\* )The IEC62209-1 and IEEE 1528 are applicable for hand-held devices used in close proximity to the ear only.

## 6.0 SAR Limits

**TABLE 2**

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)	1.6	8.0
Spatial Peak - ICNIRP/ANSI - (hands/wrists/feet/ankles averaged over 10-g)	4.0	20.0
Spatial Peak - ICNIRP - (Head and Trunk 10-g)	2.0	10.0

## 7.0 Description of Device Under Test (DUT)

This portable device operates using TDMA and analog frequency modulation (FM) signaling incorporating traditional simplex two-way radio transmission protocol.

Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into two slots. Time allocation enables each unit to transmit its voice information without interference from other transmitting units. Transmission from a unit or base station is accommodated during two time-slot lengths of 30 milliseconds with frame length of 60 milliseconds. C4FM CQPSK modulation is used at 12.5 kHz channel spacing. The TDMA technique requires sophisticated algorithms and a digital signal processor (DSP) to perform voice compressions/decompressions and RF modulation/demodulation. The maximum duty cycle for TDMA 1:2 is 50%.

This device operates in a half duplex system. A half duplex system only allows the user to transmit or receive. This device cannot transmit and receive simultaneously. The user must stop transmitting in order to receive a signal or listen for a response, regardless of PTT button or use of voice activated audio accessories. This type of operation, along with the RF safety booklet, which instructs the user to transmit no more than 50% of the time, justifies the use of 50% duty factor for this device.

This device also incorporates a Class 1 Bluetooth device which is a Frequency Hopping Spread Spectrum (FHSS) technology. The Bluetooth radio modem is used to wireless link audio accessories. The maximum actual transmission duty cycle is imposed by the Bluetooth standard. The maximum duty cycle for BT is 77%. Simultaneous transmission can occur between the BT and primary transmitter. Refer to section 14.0 Simultaneous Transmission Exclusion.

The model represented under this filing utilizes fixed antenna and an internal fixed antenna (Bluetooth) capable of transmitting in the 806-824MHz & 851-869MHz and 2.402-2.480 GHz (Bluetooth) bands respectively. The nominal output powers are 2.0 W with maximum output powers of 2.4 W (806-824MHz & 851-869MHz). The nominal BT output power is 2.5mW and maximum output power is 10.0mW as defined by upper limit of the production line final test station.

The intended operating positions are “at the face” with the DUT at least 1 inch from the mouth, and “at the body” by means of the offered body worn accessories. Body worn audio and PTT operation is accomplished by means of optional remote accessories that are connected to the radio. Operation at the body without an audio accessory attached is possible by means of BT accessories.

**8.0 Optional Accessories and Test Criteria**

This device is offered with optional accessories. All accessories were individually evaluated during the test plan creation to determine if testing was required per the guidelines outlined in “SAR Test Reduction Considerations for Occupational PTT Radios” FCC KDB 643646 to assess compliance of this device. The following sections identify the test criteria and details for each accessory category. Refer to Exhibit 7B for antenna separation distances.

**8.1 Antennas**

There is one non removable antenna and one BT internal antenna offered for this product. The table below lists their descriptions.

**TABLE 3**

Antenna Models	Description	Selected for test	Tested
PMAF4017A	Stubby Antenna, 806-870MHz, 1/4 wave, 0.5 dBi	Yes	Yes
PMLF4122A	Bluetooth Antenna, IFA 2402-2480MHz, 1/4 wave, 0.5 dBi	Yes	Yes

**8.2 Battery**

There is only one battery offered for this product. The table below lists its description.

**TABLE 4**

Battery Models	Description	Selected for test	Tested	Comments
HKNN4013A	Battery Pack, 1800 mAh Li-ion	Yes	Yes	

**8.3 Body worn Accessories**

All body worn accessories were considered. The table below lists the body worn accessories, and body worn accessory descriptions.

**TABLE 5**

Body worn Models	Description	Selected for test	Tested	Comments
PMLN5956A	Carry Holder	Yes	Yes	
PMLN6074A	Wrist Strap	No	No	Test not required

### 8.4 Audio Accessories

All audio accessories were considered. The table below lists the offered audio accessories and their descriptions. Exhibit 7B illustrates photos of the tested audio accessories.

**TABLE 6**

Audio Acc. Models	Description	Selecte d for test	Tested	Comments
PMLN5957A	Surveillance Earpiece with in-line microphone and PTT	Yes	Yes	
PMLN5958A	Swivel Earpiece with in-line microphone and PTT	No	No	By similarity to PMLN5957A

### 9.0 Description of Test System



### 9.1 Descriptions of Robotics/Probes/Readout Electronics

**TABLE 7**

Dosimetric System type	System version	DAE type	Probe Type
Schmid & Partner Engineering AG SPEAG DASY 5	52.8.2.969	DAE4	ES3DV3 (E-Field)

The DASY5™ system is operated per the instructions in the DASY5™ 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. Section 9.0 presents additional 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.

**9.2 Description of Phantom(s)**

**TABLE 8**

Phantom type	Phantom ID (s)	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support Structure Material	Loss Tangent (wood)
Dual Flat	NA	300MHz -6GHz; Er = 4+/- 1, Loss Tangent = ≤0.05	600x400x190	2mm +/- 0.2mm	Wood	< 0.05
SAM	NA					
Elliptical	OVAL 1022 OVAL 1019					

**9.3 Description of Simulated Tissue**

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.

The simulated tissue mixture was mixed based on the Simulated Tissue Composition indicated in Table 9 below for 900MHz. During the daily testing of this product, the applicable mixture was used to measure the Di-electric parameters at each of the tested frequencies to verify that the Di-electric parameters were within the tolerance of the tissue specifications.

**Simulated Tissue Composition (by mass)**

**TABLE 9**

Reference Standards	% of listed ingredients	900MHz	
		Head	Body
FCC Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 91-01) IEEE 1528-2003 IEC62209-1 (2005) CENELEC – EN62209-1 (2006)	Sugar	56.5	44.9
	Diacetin	0	0
	De ionized – Water	40.95	53.06
	Salt	1.45	0.94
	HEC	1.0	1.0
	Bact.	0.1	0.1

Reference section 10.1 for target parameters

## 9.0 Additional Test Equipment

The table below lists additional test equipment used during the SAR assessment.

**TABLE 10**

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Power Meter (Agilent)	E4419B	MY45103725	3/1/2013	3/1/2014
E-Series Avg. Power Sensor (Agilent)	E9301B	MY41495593	3/7/2013	3/7/2014
E-Series Avg. Power Sensor (Agilent)	E9301B	MY41495594	2/11/2013	2/11/2014
Bi-Directional Coupler (NARDA)	3020A	40295	6/4/2012	6/4/2014
Signal Generator (Agilent)	E4438C	MY42082269	1/24/2012	1/24/2014
AMP (Amplifier Research)	10WD1000	28782	CNR	CNR
Dickson Temperature Recorder	TM325	12121144	5/8/2013	5/8/2014
Omega Digital Thermometer with J Type TC Probe	HH200A	20857	10/25/2012	10/25/2013
Omega Digital Thermometer with J Type TC Probe	HH200A	48870	5/14/2013	5/14/2014
Omega Digital Thermometer with J Type TC Probe	HH202A	18800	2/21/2013	2/21/2014
Omega Digital Thermometer with J Type TC Probe	HH202A	18801	5/14/2013	5/14/2014
Omega Digital Thermometer with J Type TC Probe	HH202A	18812	6/10/2013	6/10/2014
LKM Electronic Digital Thermometer with Pt100 Sensor Probe	DTM3000	2959	7/24/2013	7/24/2014
Agilent PNA-L Network Analyzer	N5230C	MY49002155	8/1/2013	8/1/2014
Dielectric Assessment Kit (DAK)	DAK-12	1040	10/23/2012	10/23/2013
Speag Probe	ESDV3	3147	1/28/2013	1/28/2014
Speag Dipole	D900V2	84	8/14/2013	8/14/2015
Speag DAE	DAE4	1231	3/12/2013	3/12/2014

## 10.0 SAR Measurement System Validation and Verification

DASY output files of the probe/dipole calibration certificates and system performance test results are included in appendices A, B, C respectively.

### 10.1 System Validation

The SAR measurement system was validated according to procedures in KDB 865664. The validation status summary table is below.

**TABLE 11**

Dates	Probe Calibration Point		Probe SN	Measured Tissue Parameters		Validation for TDMA		
				$\sigma$	$\epsilon_r$	Sensitivity	Linearity	Isotropy
05/31/2013	Body	900	3147	1.01	53.7	Pass	Pass	Pass
06/03/2013	Head	900	3147	1.00	41.6	Pass	Pass	Pass

## 10.2 System Verification

System performance checks were conducted each day during the SAR assessment. The results are normalized to 1W. APPENDIX C includes DASY plots for each day during the SAR assessment. The table below summarizes the daily system check results used for the SAR assessment.

**TABLE 12**

Probe Serial #	Tissue Type	Dipole Kit / Serial #	Ref SAR @ 1W (W/kg)	System Check Results Measured (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Tested Date
3147	FCC Body	SPEAG D900V2 / 84	*10.7 +/- 10%	2.74	10.96	9/10/13
				2.71	10.84	9/13/13
				2.74	10.96	9/17/13
	IEEE/IEC Head	SPEAG D900V2 / 84	*10.5 +/- 10%	2.71	10.84	9/11/13

\*Dipole manufacture's reference target

## 10.3 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 9.0. The table below summarizes the measured tissue parameters used for the SAR assessment.

**TABLE 13**

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
806	FCC Body	0.97 (0.92-1.02)	55.3 (52.5-58.1)	0.97	54.1	9/10/13
				0.97	54.6	9/13/13
				0.97	54.3	9/17/13
806	IEEE/ IEC Head	0.90 (0.85-0.94)	41.7 (39.6-43.7)	0.89	42.6	9/11/13
869	FCC Body	1.01 (0.96-1.06)	55.1 (52.3-57.9)	1.01	53.1	9/10/13
				0.99	53.6	9/13/13
869	IEEE/ IEC Head	0.94 (0.89-0.98)	41.5 (39.4-43.6)	0.94	41.5	9/11/13
900	FCC Body	1.05 (1.00-1.10)	55.0 (52.3-57.8)	1.05	53.9	9/10/13
				1.02	54.5	9/13/13
				1.07	54.1	9/17/13
900	IEEE/ IEC Head	0.97 (0.92-1.02)	41.5 (39.4-43.6)	0.95	42.1	9/11/13

**11.0 Environmental Test Conditions**

The EME Laboratory’s ambient environment is well controlled resulting in very stable simulated tissue temperature and therefore stable dielectric properties. Simulated tissue temperature is measured prior to each scan to insure it is within +/- 2°C of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was 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:

**TABLE 14**

	<b>Target</b>	<b>Measured</b>
<b>Ambient Temperature</b>	18 – 25 °C	Range: 20.6 – 23.3°C Avg. 21.4 °C
<b>Relative Humidity</b>	30 – 70 %	Range: 27.2 – 69.7 % Avg. 49.3 %
<b>Tissue Temperature</b>	NA	Range: 19.9-20.6°C Avg. 20.3°C

Relative humidity target range is a recommended target

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.

**12.0 DUT Test Setup and Methodology**

**12.1 Measurements**

SAR measurements were performed using the DASY system described in section 8.0 using zoom scans. Elliptical flat phantoms filled with applicable simulated tissue were used for body and face testing.

The table below includes the step sizes and resolution of area and zoom scans per KDB 865664 requirements.

**TABLE 15**

<b>Description</b>	<b>≤ 3 GHz</b>	<b>&gt; 3 GHz</b>
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°

**TABLE 15 (Continued)**

Description		≤ 3 GHz	> 3 GHz
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$		≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
		When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.			

**12.2 DUT Configuration(s)**

The DUT is a portable device operational at the body and face as described in section 6.0 while using the applicable accessories listed in section 7.0. All accessories listed in section 7.0 of this report were considered when implementing the guidelines specified in KDB 643646.

**12.3 DUT Positioning Procedures**

The positioning of the device for each body location is described below and illustrated in APPENDIX G.

**12.3.1 Body**

The DUT was positioned in normal use configuration against the phantom with the offered body worn accessory as well as with and without the offered audio accessories as applicable.

**12.3.2 Head**

Not applicable.

**12.3.3 Face**

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

## 12.4 DUT Test Channels

The number of test channels was determined by using the following IEEE 1528 equation. The use of this equation produces the same or more test channels compared to the FCC KDB 447498 number of test channels formula.

$$N_c = 2 * \text{roundup}[10 * (f_{\text{high}} - f_{\text{low}}) / f_c] + 1$$

Where

$N_c$  = Number of channels

$F_{\text{high}}$  = Upper channel

$F_{\text{low}}$  = Lower channel

$F_c$  = Center channel

## 12.5 SAR Result 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 data tables is determined by scaling the measured SAR to account for power leveling variations and power slump. A table and graph of output power versus time is provided in APPENDIX F. For this device the “Max Calc. 1g-SAR” and “Max Calc.10g-SAR” are scaled using the following formula:

$$\text{Max\_Calc} = \text{SAR\_meas} \cdot 10^{\frac{-\text{Drift}}{10}} \cdot \frac{P_{\text{max}}}{P_{\text{int}}} \cdot \text{DC}$$

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

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

Drift = DASY drift results (dB)

$\text{SAR\_meas}$  = Measured 1-g or 10-g Avg. SAR (W/kg)

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  $P_{\text{int}} > P_{\text{max}}$ , then  $P_{\text{max}}/P_{\text{int}} = 1$ .

Drift = 1 for positive drift

Additional SAR scaling was applied using the methodologies outlined in FCC KDB 865664 using tissue sensitivity values. SAR was scaled for conditions where the tissue permittivity was measured above the nominal target and for tissue conductivity that was measured below the nominal target. Negative or reduced SAR scaling is not permitted.

## 12.6 DUT Test Plan

The guidelines and requirements outlined in “SAR Test Reduction Considerations for Occupational PTT Radios” FCC KDB 643646 were used to assess compliance of this device. All modes of operation identified in section 6.0 were considered during the development of the test plan. All tests were performed in TDMA mode and then 50% duty cycle was applied to the final results.

Standalone and simultaneous BT testing were assessed in section 14.0 per the guidelines of KDB 447498.

**13.0 DUT Test Data**

**13.1 Assessments at the Body for 806-824MHz band**

The battery HKNN4013A was selected as the default battery for assessments at the Body since only one battery is offered (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within Part 90 frequency range (806-824MHz) using the default battery HKNN4013A is indicated in Table 16. The channel with the highest conducted power will be identified as the default channel per KDB 643646 SAR Test for PTT Radios. SAR plots of the highest results per table (bolded) are presented in APPENDICES D-E.

**TABLE 16**

Test Freq (MHz)	Power (W)
806.000	2.40
815.000	2.40
824.000	2.39

**Assessments at the Body with Body worn PMLN5956A**

Assessment of the offered antenna with the default battery and body worn accessory PMLN5956A per KDB 643646 SAR Test for PTT Radios – Body SAR Test Considerations for Body worn Accessories. Refer to Table 16 for highest output power channel.

**TABLE 17**

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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)	Run#
PMAF4017A	HKNN4013A	PMLN5956A	PMLN5957A	806.000	2.33	-0.34	1.90	1.41	<b>1.06</b>	<b>0.79</b>	AvG-Ab-130910-02
				815.000							
				824.000							

**Assessment at the Body with other audio accessories**

Assessment per “KDB 643646 Body SAR Test Consideration for Audio Accessories without Built-in Antenna; Sec 1, A. when overall < 4.0 W/kg, SAR tested for that audio accessory is not necessary.” This was applicable to all remaining accessories.

**Assessment of wireless BT configuration**

Assessment using the overall highest SAR configuration at the body from above without an audio accessory attached.

**TABLE 18**

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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)	Run#
PMAF4017A	HKNN4013A	PMLN5956A	None	806.000	2.36	-0.40	2.40	1.69	<b>1.34</b>	<b>0.94</b>	HvH-Ab-130913-02
				815.000							
				824.000							

**13.2 Assessments at the Body for 851-869MHz band**

The battery HKNN4013A was selected as the default battery for assessments at the Body since only one battery is offered (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within Part 90 frequency range (851-869MHz) using the default battery HKNN4013A is indicated in Table 19. The channel with the highest conducted power will be identified as the default channel per KDB 643646 SAR Test for PTT Radios. SAR plots of the highest results per table (bolded) are presented in APPENDICES D-E.

**TABLE 19**

Test Freq (MHz)	Power (W)
851.000	2.37
860.000	2.36
869.000	2.40

**Assessments at the Body with Body worn PMLN5956A**

Assessment of the offered antenna with the default battery and body worn accessory PMLN5956A per KDB 643646 SAR Test for PTT Radios – Body SAR Test Considerations for Body worn Accessories. Refer to Table 19 for highest output power channel.

**TABLE 20**

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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)	Run#
PMAF4017A	HKNN4013A	PMLN5956A	PMLN5957A	851.000							
				860.000							
				869.000	2.30	-0.39	1.44	0.16	<b>0.82</b>	<b>0.61</b>	AvG-Ab-130910-03

**Assessment at the Body with other audio accessories**

Assessment per “KDB 643646 Body SAR Test Consideration for Audio Accessories without Built-in Antenna; Sec 1, A. when overall < 4.0 W/kg, SAR tested for that audio accessory is not necessary.” This was applicable to all remaining accessories.

**Assessment of wireless BT configuration**

Assessment using the overall highest SAR configuration at the body from above without an audio accessory attached.

**TABLE 21**

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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)	Run#
PMAF4017A	HKNN4013A	PMLN5956A	None	851.000							
				860.000							
				869.000	2.40	-0.43	1.58	1.10	<b>0.87</b>	<b>0.61</b>	HvH-Ab-130913-03

**13.3 Assessments at the Face for 806-824MHz band**

The battery HKNN4013A was selected as the default battery for assessments at the Face since only one battery is offered (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within Part 90 frequency range (806-824MHz) using the default battery HKNN4013A is indicated in Table 22. The channel with the highest conducted power will be identified as the default channel per KDB 643646 SAR Test for PTT Radios. SAR plots of the highest results per table (bolded) are presented in APPENDICES D-E.

**TABLE 22**

Test Freq (MHz)	Power (W)
806.000	2.40
815.000	2.40
824.000	2.39

Assessment of the offered antenna with the default battery HKNN4013A, front of DUT facing phantom per KDB 643646 SAR Test for PTT Radios – Head SAR Test Considerations. Refer to Table 22 for highest output power channel.

**TABLE 23**

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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)	Run#
PMAF4017A	HKNN4013A	None	None	806.000	2.35	-0.32	1.89	1.39	<b>1.04</b>	<b>0.76</b>	HvH-Face-130911-02
				815.000							
				824.000							

**13.4 Assessments at the Face for 851-869MHz band**

The battery HKNN4013A was selected as the default battery for assessments at the Face since only one battery is offered (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within Part 90 frequency range (851-869MHz) using the default battery HKNN4013A is indicated in Table 24. The channel with the highest conducted power will be identified as the default channel per KDB 643646 SAR Test for PTT Radios. SAR plots of the highest results per table (bolded) are presented in APPENDICES D-E.

**TABLE 24**

Test Freq (MHz)	Power (W)
851.000	2.37
860.000	2.36
869.000	2.40

Assessment of the offered antenna with the default battery HKNN4013A, front of DUT facing phantom per KDB 643646 SAR Test for PTT Radios– Head SAR Test Considerations. Refer to Table 24 for highest output power channel.

**TABLE 25**

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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)	Run#
PMAF4017A	HKNN4013A	None	None	851.000							
				860.000							
				869.000	2.38	-0.35	1.19	0.874	<b>0.65</b>	<b>0.48</b>	HvH-Face-130911-03

**13.5 Assessment for Industry Canada**

Based on the assessment results for body and face per KDB643646, additional tests were not required for Industry Canada frequency range (806-824MHz, 851-869MHz) as the testing performed is in compliance with Industry Canada frequency range.

**13.6 Assessment at the Bluetooth band**

Per guidelines in KDB 447498, the following formula was used to determine the test exclusion for standalone Bluetooth transmitter;

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] * [\sqrt{F_{(\text{GHz})}}] = 2.5, \text{ which is } \leq 3 \text{ for 1-g SAR}$$

Where:

Max. power = 8mW (10mW\*77% duty cycle)

Min. test separation distance = 5mm for actual test separation < 5mm

F(GHz) = 2.48 GHz

Per the result from the calculation above, the standalone SAR assessment was not required for Bluetooth band. Therefore, SAR results for Bluetooth are not reported herein.

**13.7 Shortened Scan Assessment**

A “shortened” scan using the highest SAR configuration overall from above was performed to validate the SAR drift of the full DASY5™ coarse and 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 zoom scan only was performed. The results of the shortened cube scan presented in APPENDIX D demonstrate that the scaling methodology used to determine the calculated SAR results presented herein are valid. The SAR result from the table below is provided in APPENDIX D.

**TABLE 26**

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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)	Run#
PMAF4017A	HKNN4013A	PMLN5956A	None	806.000	2.27	-0.26	2.52	1.84	1.41	1.03	HvH-Ab-130917-09

**14.0 Simultaneous Transmission Exclusion**

Per guidelines in KDB 447498, the following formula was used to determine the test exclusion to an antenna that transmits simultaneously with other antennas for test distances ≤ 50mm:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] * [\sqrt{F(\text{GHz})/X}] = 0.34 \text{ W/kg (1g \& 10g)}$$

Where:

X = 7.5 for 1g-SAR; 18.75 for 10g

Max. power = 8mW (10mW\*77% duty cycle)

Min. test separation distance = 5mm for actual test separation < 5mm

F(GHz) = 2.48 GHz

**15.0 Results Summary**

Based on the test guidelines from KDB 643646 and satisfying frequencies with Part 90 FCC band to be in compliance with Industry Canada Frequency range, the highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for this filing:

**TABLE 27**

Designator	Frequency band (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
FCC/ Industry Canada	806-824	1.41	1.03	1.04	0.76
	851-869	0.87	0.65	0.65	0.48

All results are scaled to the maximum output power

The highest combined 1g-SAR results for simultaneous is indicated in the following table:

**TABLE 28**

Designator	Frequency bands	Combined 1g-SAR (W/kg)	Combined 10g-SAR (W/kg)
FCC/ Industry Canada	806-824 & 851-869, 2402-2480MHz	1.75	1.37

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of 8 W/kg averaged over 1 gram per the requirements of 47 CFR 2.1093(d). The 10 grams result is not applicable to FCC filing.

## **16.0 Variability Assessment**

NA.

## **17.0 System Uncertainty**

A system uncertainty analysis is not required for this report per KDB 865664 because the highest report SAR value for Occupational exposure is less than 7.5W/kg.

Per the guidelines of ISO 17025 a reported system uncertainty is required and therefore the highest expanded system uncertainty for K=2 is 22% for 800MHz to 3.0GHz.

**APPENDIX A**  
**Probe Calibration Certificates**

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



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

Certificate No: **ES3-3147\_Jan13**

**CALIBRATION CERTIFICATE**

Object: **ES3DV3 - SN:3147**

Calibration procedure(s): **QA CAL-01.v8, QA CAL-12.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes**

Calibration date: **January 28, 2013**

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8646C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name <b>Jeton Kastrati</b>	Function Laboratory Technician	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function Technical Manager	Signature 

Issued: January 29, 2013

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

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



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

Accredited by the Swiss 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
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* 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<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- 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<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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.

ES3DV3 – SN:3147

January 28, 2013

# Probe ES3DV3

## SN:3147

Manufactured: July 12, 2007  
Calibrated: January 28, 2013

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

ES3DV3- SN:3147

January 28, 2013

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3147

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V/m})^2$ ) <sup>A</sup>	1.26	1.20	1.19	$\pm 10.1 \%$
DCP (mV) <sup>B</sup>	103.1	101.0	99.6	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>C</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	157.3	$\pm 3.3 \%$
		Y	0.0	0.0	1.0		152.9	
		Z	0.0	0.0	1.0		151.1	
10108	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.53	67.9	20.2	5.80	138.1	$\pm 1.2 \%$
		Y	6.46	67.3	19.7		133.3	
		Z	6.50	67.5	19.9		133.6	
10148	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.53	67.9	20.2	5.84	138.1	$\pm 12.2 \%$
		Y	6.46	67.3	19.7		133.3	
		Z	6.50	67.5	19.9		133.6	
10110	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.23	67.5	20.1	5.75	135.6	$\pm 1.2 \%$
		Y	6.15	66.8	19.4		130.8	
		Z	6.25	67.3	19.9		131.6	
10154	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.23	67.5	20.1	5.76	135.6	$\pm 12.2 \%$
		Y	6.15	66.8	19.4		130.8	
		Z	6.25	67.3	19.9		131.6	
10112	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	7.21	66.7	19.8	6.59	103.7	$\pm 1.4 \%$
		Y	7.74	68.1	20.4		144.8	
		Z	7.86	68.6	20.8		145.4	
10109	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	7.21	66.7	19.8	6.43	103.7	$\pm 12.2 \%$
		Y	7.74	68.1	20.4		144.8	
		Z	7.86	68.6	20.8		145.4	
10150	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	7.21	66.7	19.8	6.60	103.7	$\pm 12.2 \%$
		Y	7.74	68.1	20.4		144.8	
		Z	7.86	68.6	20.8		145.4	
10149	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	7.21	66.7	19.8	6.42	103.7	$\pm 12.2 \%$
		Y	7.74	68.1	20.4		144.8	
		Z	7.86	68.6	20.8		145.4	
10143	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	7.07	68.2	20.6	6.35	140.6	$\pm 1.2 \%$
		Y	6.94	67.4	19.9		135.5	
		Z	7.09	67.9	20.4		136.9	
10147	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	7.08	68.3	20.9	6.72	135.1	$\pm 1.2 \%$
		Y	6.92	67.5	20.2		129.5	
		Z	7.09	67.9	20.6		131.8	

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10159	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	7.08	68.3	20.9	6.56	135.1	±12.2 %
		Y	6.92	67.5	20.2		129.5	
		Z	7.09	67.9	20.6		131.8	
10157	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	7.08	68.3	20.9	6.49	135.1	±12.2 %
		Y	6.92	67.5	20.2		129.5	
		Z	7.09	67.9	20.6		131.8	
10164	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	7.08	68.3	20.9	6.44	135.1	±12.2 %
		Y	6.92	67.5	20.2		129.5	
		Z	7.09	67.9	20.6		131.8	
10165	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	7.08	68.3	20.9	6.69	135.1	±12.2 %
		Y	6.92	67.5	20.2		129.5	
		Z	7.09	67.9	20.6		131.8	
10146	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	7.08	68.3	20.9	6.41	135.1	±12.2 %
		Y	6.92	67.5	20.2		129.5	
		Z	7.09	67.9	20.6		131.8	
10158	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	7.59	68.6	21.0	6.62	145.3	±1.4 %
		Y	7.47	67.8	20.3		139.7	
		Z	7.58	68.2	20.7		141.2	
10111	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	7.59	68.6	21.0	6.44	145.3	±12.2 %
		Y	7.47	67.8	20.3		139.7	
		Z	7.58	68.2	20.7		141.2	
10113	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	7.59	68.6	21.0	6.62	145.3	±12.2 %
		Y	7.47	67.8	20.3		139.7	
		Z	7.58	68.2	20.7		141.2	
10155	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	7.59	68.6	21.0	6.43	145.3	±12.2 %
		Y	7.47	67.8	20.3		139.7	
		Z	7.58	68.2	20.7		141.2	
10161	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	7.59	68.6	21.0	6.43	145.3	±12.2 %
		Y	7.47	67.8	20.3		139.7	
		Z	7.58	68.2	20.7		141.2	
10162	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	7.59	68.6	21.0	6.58	145.3	±12.2 %
		Y	7.47	67.8	20.3		139.7	
		Z	7.58	68.2	20.7		141.2	
10163	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	5.83	67.0	19.8	5.68	131.0	±0.9 %
		Y	5.77	66.4	19.3		125.8	
		Z	5.85	66.6	19.5		127.4	
10156	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	5.83	67.0	19.8	5.79	131.0	±12.2 %
		Y	5.77	66.4	19.3		125.8	
		Z	5.85	66.6	19.5		127.4	
10145	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	5.83	67.0	19.8	5.76	131.0	±12.2 %
		Y	5.77	66.4	19.3		125.8	
		Z	5.85	66.6	19.5		127.4	

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10142	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	5.83	67.0	19.8	5.73	131.0	±12.2 %
		Y	5.77	66.4	19.3		125.8	
		Z	5.85	66.6	19.5		127.4	
10167	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	6.23	68.0	20.5	6.21	127.5	±0.9 %
		Y	6.02	66.9	19.7		120.9	
		Z	6.21	67.4	20.1		124.7	
10179	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	5.96	68.4	21.0	6.50	119.0	±1.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10170	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	5.96	68.4	21.0	6.52	119.0	±12.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10176	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	5.96	68.4	21.0	6.52	119.0	±12.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10188	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	5.96	68.4	21.0	6.52	119.0	±12.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10180	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	5.96	68.4	21.0	6.51	119.0	±12.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10178	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	5.96	68.4	21.0	6.52	119.0	±12.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10182	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	5.96	68.4	21.0	6.52	119.0	±12.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10185	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	5.96	68.4	21.0	6.51	119.0	±12.2 %
		Y	5.71	67.1	20.0		112.9	
		Z	5.94	67.7	20.5		116.7	
10187	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	5.07	66.8	19.9	5.73	118.7	±0.9 %
		Y	4.96	66.0	19.2		113.4	
		Z	5.11	66.4	19.6		115.9	
10166	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	5.07	66.8	19.9	5.46	118.7	±12.2 %
		Y	4.96	66.0	19.2		113.4	
		Z	5.11	66.4	19.6		115.9	
10181	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.07	66.8	19.9	5.73	118.7	±12.2 %
		Y	4.96	66.0	19.2		113.4	
		Z	5.11	66.4	19.6		115.9	
10169	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.07	66.8	19.9	5.73	118.7	±12.2 %
		Y	4.96	66.0	19.2		113.4	
		Z	5.11	66.4	19.6		115.9	

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10175	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.07	66.8	19.9	5.73	118.7	±12.2 %
		Y	4.96	66.0	19.2		113.4	
		Z	5.11	66.4	19.6		115.9	
10177	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	5.07	66.8	19.9	5.73	118.7	±12.2 %
		Y	4.96	66.0	19.2		113.4	
		Z	5.11	66.4	19.6		115.9	
10184	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	5.07	66.8	19.9	5.73	118.7	±12.2 %
		Y	4.96	66.0	19.2		113.4	
		Z	5.11	66.4	19.6		115.9	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3147

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>e</sup>	Conductivity (S/m) <sup>f</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
300	45.3	0.87	7.25	7.25	7.25	0.26	1.16	± 13.4 %
450	43.5	0.87	6.69	6.69	6.69	0.16	1.65	± 13.4 %
750	41.9	0.89	6.47	6.47	6.47	0.49	1.42	± 12.0 %
900	41.5	0.97	6.14	6.14	6.14	0.61	1.27	± 12.0 %
1810	40.0	1.40	5.03	5.03	5.03	0.74	1.13	± 12.0 %
1950	40.0	1.40	4.81	4.81	4.81	0.79	1.20	± 12.0 %
2300	39.5	1.67	4.60	4.60	4.60	0.57	1.42	± 12.0 %
2450	39.2	1.80	4.36	4.36	4.36	0.75	1.25	± 12.0 %
2600	39.0	1.96	4.23	4.23	4.23	0.77	1.30	± 12.0 %
3500	37.9	2.91	3.96	3.96	3.96	1.00	1.23	± 13.1 %
3700	37.7	3.12	3.71	3.71	3.71	1.00	1.31	± 13.1 %

<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3147

### Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>f</sup>	Conductivity (S/m) <sup>f</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
300	58.2	0.92	7.12	7.12	7.12	0.22	1.81	± 13.4 %
450	56.7	0.94	7.04	7.04	7.04	0.11	2.20	± 13.4 %
750	55.5	0.96	6.13	6.13	6.13	0.39	1.56	± 12.0 %
900	55.0	1.05	5.99	5.99	5.99	0.41	1.59	± 12.0 %
1810	53.3	1.52	4.82	4.82	4.82	0.66	1.29	± 12.0 %
1950	53.3	1.52	4.75	4.75	4.75	0.50	1.60	± 12.0 %
2300	52.9	1.81	4.38	4.38	4.38	0.68	1.35	± 12.0 %
2450	52.7	1.95	4.22	4.22	4.22	0.80	1.05	± 12.0 %
2600	52.5	2.16	4.02	4.02	4.02	0.72	1.07	± 12.0 %
3500	51.3	3.31	3.75	3.75	3.75	1.00	1.12	± 13.1 %
3700	51.0	3.55	3.34	3.34	3.34	1.00	1.31	± 13.1 %

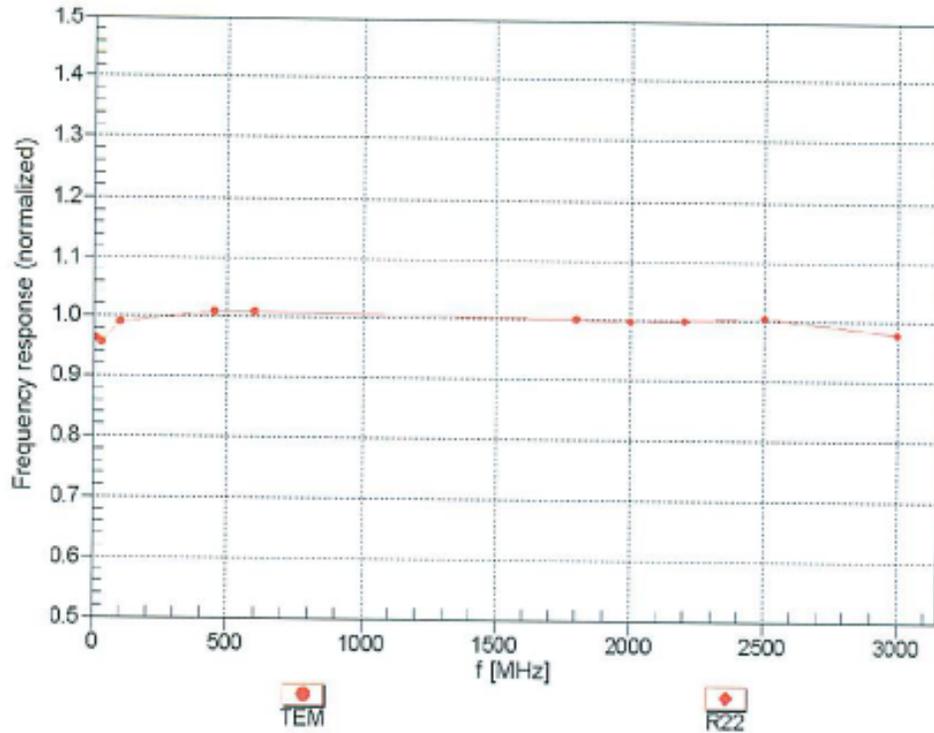
<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

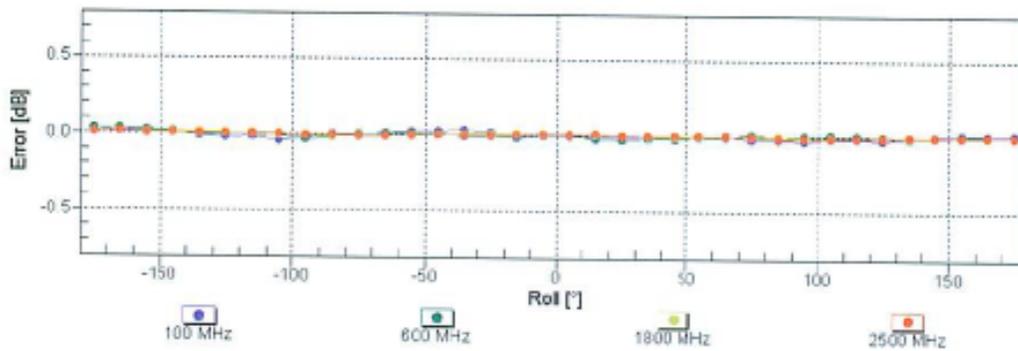
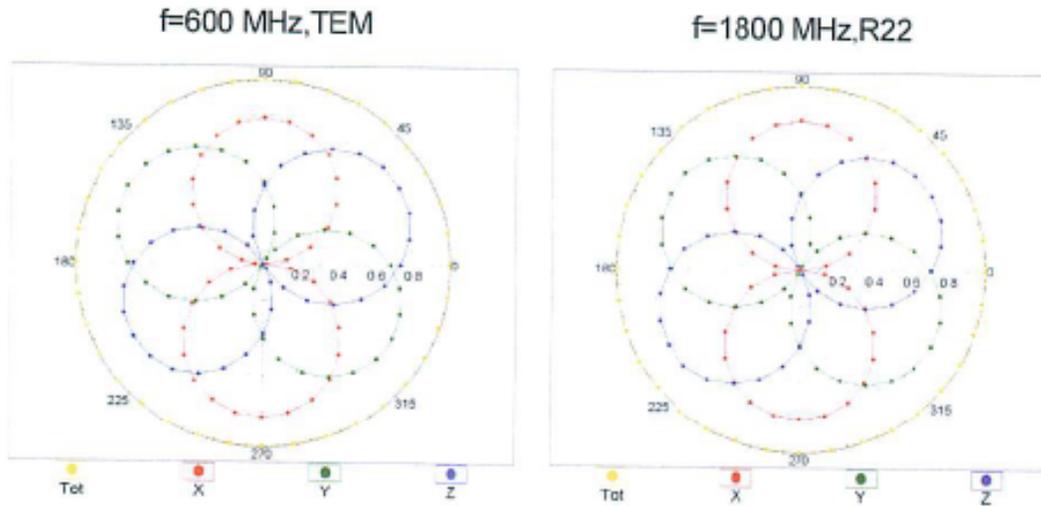


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

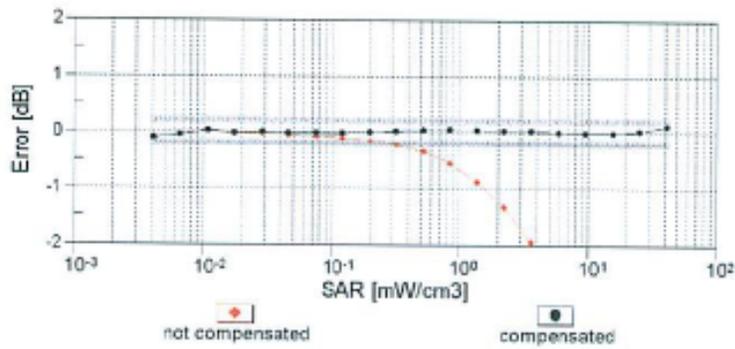
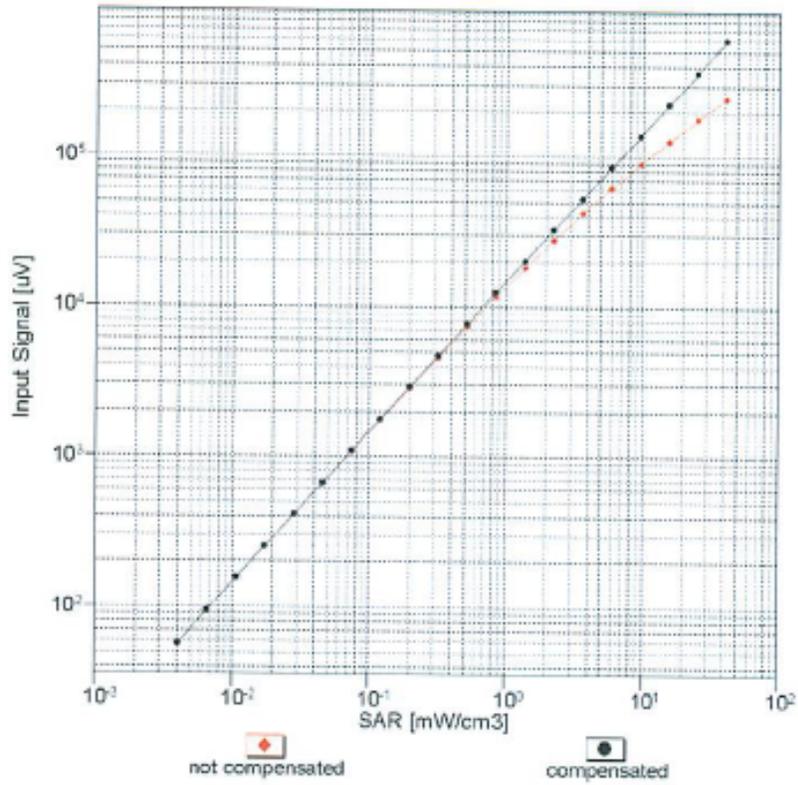


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

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### Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f = 900 MHz)

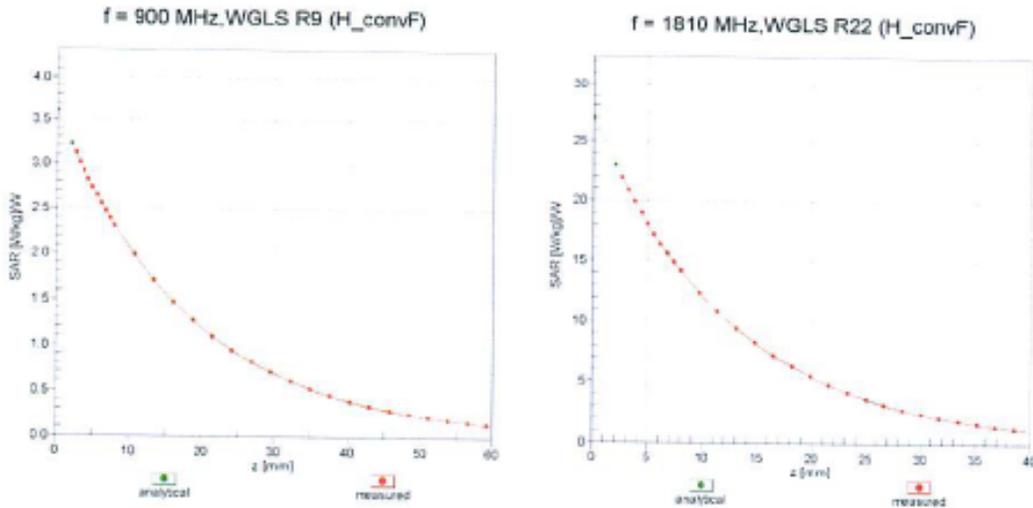


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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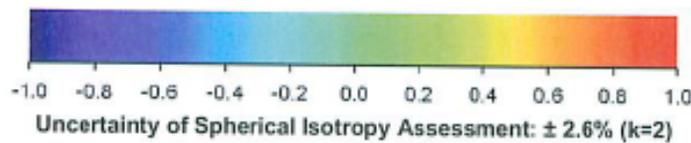
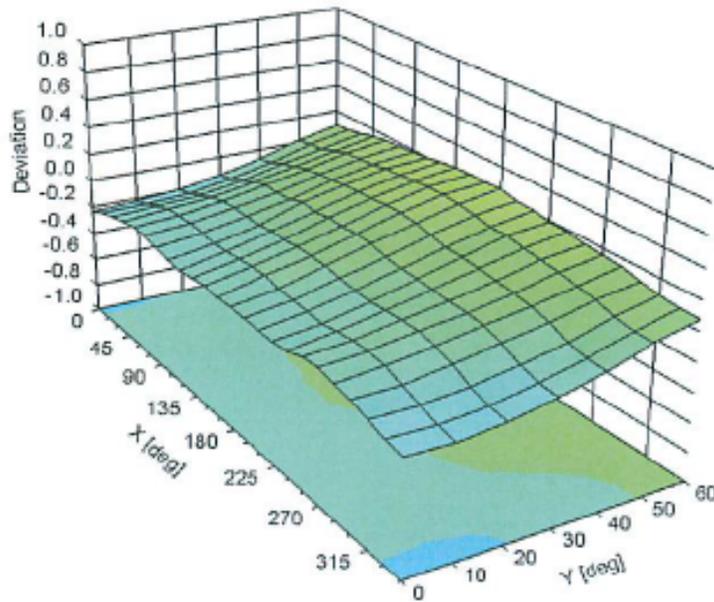
January 28, 2013

### Conversion Factor Assessment



### Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ), f = 900 MHz



ES3DV3- SN:3147

January 28, 2013

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3147

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	14.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Schmid & Partner Engineering AG

**s p e a g**

Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 44 245 9700, Fax +41 44 245 9779  
info@speag.com, http://www.speag.com

### Additional Conversion Factors for Dosimetric E-Field Probe

Type:	ES3DV3
Serial Number:	3147
Place of Assessment:	Zurich
Date of Assessment:	January 30, 2013
Probe Calibration Date:	January 28, 2013

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 450, 900 or at 1810 MHz.

Assessed by:



Schmid & Partner Engineering AG

**s p e a g**

Zeughausstrasse 43, 8004 Zurich, Switzerland  
 Phone +41 44 245 9700, Fax +41 44 245 9779  
 info@speag.com, http://www.speag.com

**Dosimetric E-Field Probe ES3DV3 SN:3147**

Conversion factor ( $\pm$  standard deviation)

150 $\pm$ 50 MHz	<i>ConvF</i>	8.35 $\pm$ 10%	$\epsilon_r = 52.3 \pm 5\%$ $\sigma = 0.76 \pm 5\%$ mho/m (head tissue)
250 $\pm$ 50 MHz	<i>ConvF</i>	7.59 $\pm$ 10%	$\epsilon_r = 47.6 \pm 5\%$ $\sigma = 0.83 \pm 5\%$ mho/m (head tissue)
150 $\pm$ 50 MHz	<i>ConvF</i>	8.06 $\pm$ 10%	$\epsilon_r = 61.9 \pm 5\%$ $\sigma = 0.80 \pm 5\%$ mho/m (body tissue)
250 $\pm$ 50 MHz	<i>ConvF</i>	7.64 $\pm$ 10%	$\epsilon_r = 59.4 \pm 5\%$ $\sigma = 0.88 \pm 5\%$ 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 DASY Manual.**

**APPENDIX B**  
**Dipole Calibration Certificates**

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



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

Accredited by the Swiss 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 EME**

Certificate No: **D900V2-084\_Apr13**

**CALIBRATION CERTIFICATE**

Object **D900V2 - SN: 084**

Calibration procedure(s) **QA CAL-05.v9  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **April 15, 2013**

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 EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 15, 2013

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

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



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

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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%.

**Measurement Conditions**

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

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz $\pm$ 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.7 $\pm$ 6 %	0.97 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.64 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	10.5 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.70 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.78 W/kg $\pm$ 16.5 % (k=2)

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.9 $\pm$ 6 %	1.03 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	10.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.71 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.90 W/kg $\pm$ 16.5 % (k=2)

**Appendix**

**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	50.3 $\Omega$ - 6.8 j $\Omega$
Return Loss	- 23.3 dB

**Antenna Parameters with Body TSL**

Impedance, transformed to feed point	46.7 $\Omega$ - 8.9 j $\Omega$
Return Loss	- 20.2 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.390 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

**Additional EUT Data**

Manufactured by	SPEAG
Manufactured on	September 20, 2000

**DASY5 Validation Report for Head TSL**

Date: 15.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 084**

Communication System: UID 0 - CW; Frequency: 900 MHz

Medium parameters used:  $f = 900 \text{ MHz}$ ;  $\sigma = 0.97 \text{ S/m}$ ;  $\epsilon_r = 40.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.95, 5.95, 5.95); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**

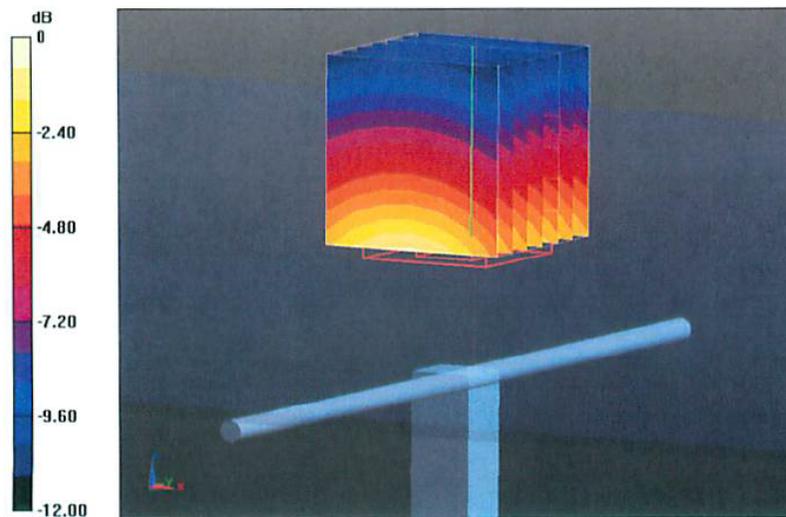
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.030 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 4.01 W/kg

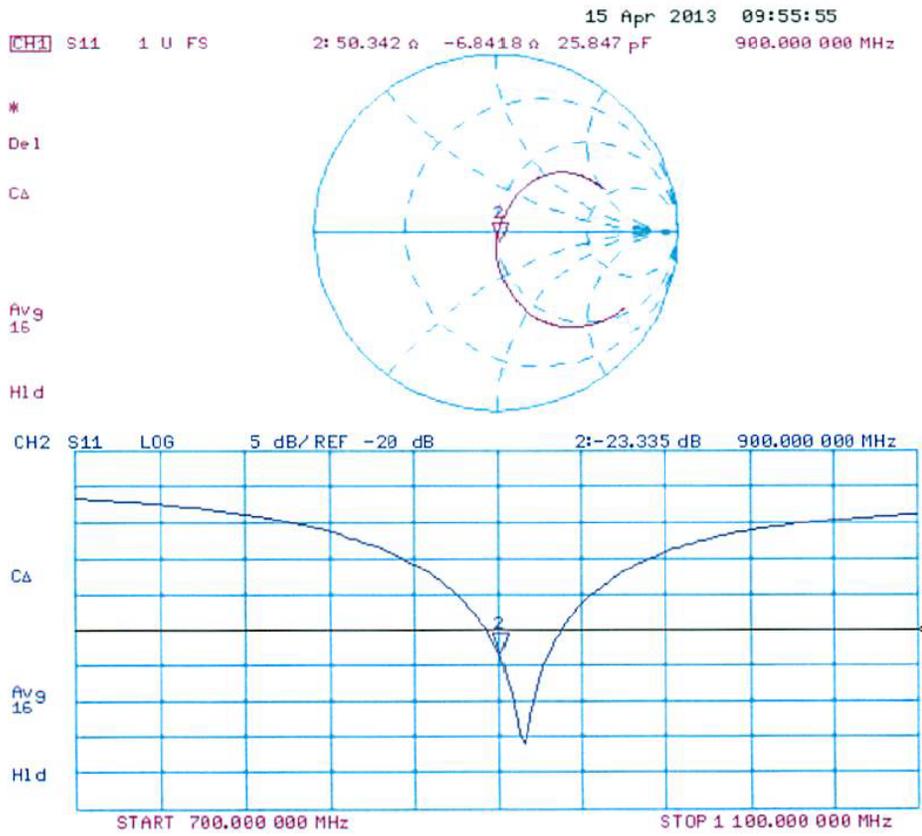
**SAR(1 g) = 2.64 W/kg; SAR(10 g) = 1.7 W/kg**

Maximum value of SAR (measured) = 3.09 W/kg



0 dB = 3.09 W/kg = 4.90 dBW/kg

### Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body TSL**

Date: 15.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 084**

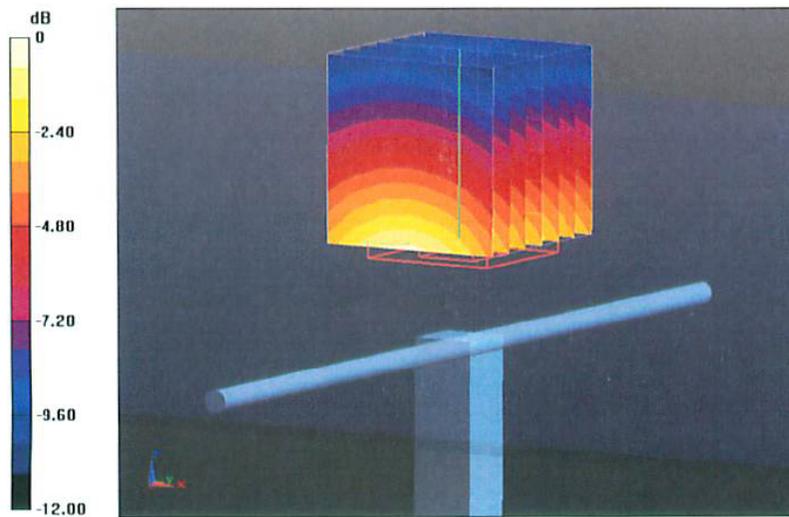
Communication System: UID 0 - CW; Frequency: 900 MHz  
 Medium parameters used:  $f = 900 \text{ MHz}$ ;  $\sigma = 1.03 \text{ S/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section  
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.95, 5.95, 5.95); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**

Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$   
 Reference Value = 56.474 V/m; Power Drift = 0.03 dB  
 Peak SAR (extrapolated) = 3.92 W/kg  
**SAR(1 g) = 2.64 W/kg; SAR(10 g) = 1.71 W/kg**  
 Maximum value of SAR (measured) = 3.08 W/kg



0 dB = 3.08 W/kg = 4.89 dBW/kg

### Impedance Measurement Plot for Body TSL

