MOTOROLA SOLUTIONS

ACCREDITED
TESTING CERT # 2518.01

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

Motorola Solutions Inc.
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Date of Report: **12/11/2014**
Report Revision: **A**

Responsible Engineer:	Deanna Zakharia (EME Lab Senior Resource Manager)
Report Author:	Jessica Zada (EME Engineer)
Date/s Tested:	11/7/2014, 11/14/2014
Manufacturer/Location:	Plantation
Sector/Group/Div.:	AESS
Date submitted for test:	10/22/2014
DUT Description:	APX6000, 380-470MHz, 0.25-5W, 6.25kHz/12.5kHz/25kHz, Top Display Model with GPS. Capable of digital and analog FM transmission. Also capable of TDMA transmission. This radio is Bluetooth capable.
Test TX mode(s):	CW (PTT)
Max. Power output:	5.6W
Nominal Power:	5.0W
Tx Frequency Bands:	380-470MHz; Bluetooth 2.402-2.480GHz
Signaling type:	FM, TDMA
Model(s) Tested:	H98QDD9PW5AN (NUE1006)
Model(s) Certified:	H98QDD9PW5AN (NUE1006)
Serial Number(s):	CAH14DKK9N & CAH14DKK9P
Classification:	Occupational/Controlled
FCC ID:	AZ489FT4892; 380-470MHz
IC:	109U-89FT4892

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 OET Bulletin 65. 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 4.0 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
Digitally signed by Deanna Zakharia DN: cn=Deanna Zakharia, o=Motorola Solutions, ou=Regulatory Compliance Lab, email=edc015@motorolasolutions.com, c=US Date: 2014.12.12 08:34:21 -05'00'

Deanna Zakharia
EMS EME Lab Senior Resource Manager,
Laboratory Director
Approval Date: 12/12/2014

Certification Date: 12/9/2014

Certification No.: L1141110

Part 1 of 2

APPENDICES

Part 2 of 2

APPENDICES

Report Revision History

Date	Revision	Comments
11/20/2014	O	PCII Report of Design Change
12/11/2014	A	References updated Pg.6 Dipole impedance and return loss added Pg.46

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 H98QDD9PW5AN (NUE1006). This device is classified as Occupational/Controlled. The information herein is to show evidence of Class II Permissive Change compliance based on SAR evaluation of a design change (PA) made to the DUT.

2.0 FCC SAR Summary

Table 1

Equipment Class	Frequency band (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
TNF	406.1-454 MHz 456-470 MHz	5.64	3.68	3.15	2.36
*DSS	2402-2480MHz	NA	NA	NA	NA
Simultaneous Results		NA	NA	NA	NA

*Results not required per KDB (refer to sections 13.8 and 14.0)

3.0 Abbreviations / Definitions

BT: Bluetooth
CNR: Calibration Not Required
CW: Continuous Wave
C4FM: Continuous 4 Level Frequency Modulation
CQPSK: Compatible Quadrature Phase Shift Keying
DPSK: Differential Phase-Shift Keying
DQPSK: Differential Quadrature Phase-Shift Keying
DSP: Digital Signal Processor
DSS: Direct Spread Spectrum
DUT: Device Under Test
EDR: Enhanced Data Rate
EME: Electromagnetic Energy
FHSS: Frequency Hopping Spread Spectrum
FM: Frequency Modulation
GFSK: Gaussian Frequency-Shift Keying
LMR: Land Mobile Radio
LTE: Long Term Evolution
NA: Not Applicable
OFDM: Orthogonal Frequency Division Multiplexing
PSM: Public Safety Microphone
PTT: Push to Talk
QPSK: Quadrature Pulse Shift Key

RB: Resource Blocks
RSM: Remote Speaker Microphone
SAR: Specific Absorption Rate
SC-FDMA: Single Carrier Frequency Division Multiple Access
TDD: Time Division Duplex
TDMA: Time Division Multiple Access
TNF: Licensed Non-Broadcast Transmitter Held to Face
VoLTE; Voice over LTE
4FSK: 4 Level Frequency Shift Keying
16QAM: 16 State Quadrature Amplitude Modulation

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)
- Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C.: 1997.
- 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).

- FCC KDB – 643646 D01 SAR Test for PTT Radios v01r01 (04/04/2011)
- FCC KDB – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03 (02/07/2014)
  D02 RF Exposure Reporting v01r01 (05/28/2013)
- FCC KDB – 447498 D01 General RF Exposure Guidance v05r02 (02/07/2014)
- FCC KDB – 941225 D05 SAR for LTE Devices v02r03 (12/05/2013)

5.0 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

6.0 Description of Device Under Test (DUT)

This portable transmits using FM (frequency modulation) and incorporates traditional simplex two-way radio transmission protocol. Its normal use is to be 5-5-90 (5% TX, 5% RX and 90% standby). It is also capable of TDMA transmission.

Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into four slots, one for each unit. 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 in time-slot lengths of 15 milliseconds and frame lengths of 60 milliseconds. The TDMA technique requires sophisticated algorithms and a digital signal processor (DSP) to perform voice compressions/decompressions and RF modulation/demodulation. Duty cycle is 2:1, 2 slot TDMA with transmit taking 1 slot.

The LMR bands in this device operate 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. Bluetooth v1.1, 1.2, 2.0, and 2.1 packet types of varying duty cycles: 1-slot, 3-slot and 5-slot packets. A 5-slot packet type receives on 1-slot and transmits on 5-slots, and thus is the worst-case. The maximum duty cycle becomes (2712+72+54+16)/(625*6) = 2854/3750 = 76.1%.

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.

7.0 Optional Accessories and Test Criteria

This device is offered with optional accessories. The following sections identify the test criteria and details for each accessory category applicable for this PCII filing only. Please refer to initial filing for a detailed listing of previously approved offered accessories.

7.1 Antennas

There are two antennas applicable for this PCII filing. The Table below lists their descriptions.

Table 3

Antenna Models	Description	Selected for test	Tested
FAF5259A	Helix Stubby UHF R1/GPS 380-470MHz / 1575MHz , ¼ wave, -2.0 dBd	Yes	Yes
PMAE4065A	UHF/GPS (radio and PSM), 380-520MHz / 1575MHz, ¼ wave, -2.0 dBd	Yes	Yes

7.2 Battery

The Table below lists the batteries considered in order to demonstrate PCII compliance.

Table 4

Battery Models	Description	Selected for test	Tested	Comments
PMNN4403B	STD IP67 Li-ion 2050mAh	Yes	Yes	
NNTN7034B	Impress Li-ion 4000 mAh Battery	Yes	Yes	

7.3 Body worn Accessories

The Table below lists the body worn accessories considered in order to demonstrate PCII compliance.

Table 5

Body worn Models	Description	Selected for test	Tested	Comments
NTN9179A	Swivel D-clip and Belt Loop	Yes	Yes	
4205823V01	PSM Belt clip	Yes	Yes	

7.4 Audio Accessories

Table below lists the audio accessory considered in order to demonstrate PCII compliance. Previous FCC filing illustrates a photo of the tested audio accessory.

Table 6

Audio Acc. Models	Description	Selected for test	Tested	Comments
PMMN4059B	PSM IP54 WITH 3.5MM JACK RX 18 in. (w/ 4205823V01 beltclip)	Yes	Yes	

8.0 Description of Test System

8.1 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	DAE3	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 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.

8.2 Description of Phantom(s)

Table 8

<table>
<tr><th>Phantom Type</th><th>Phantom(s) Used</th><th>Material Parameters</th><th>Phantom Dimensions LxWxD (mm)</th><th>Material Thickness (mm)</th><th>Support Structure Material</th><th>Loss Tangent (wood)</th></tr>
<tr><td>Triple Flat</td><td>NA</td><td>200MHz -6GHz; Er = 3-5, Loss Tangent = ≤0.05</td><td>280x175x175</td><td rowspan="3">2mm +/- 0.2mm</td><td rowspan="3">Wood</td><td rowspan="3">< 0.05</td></tr>
<tr><td>SAM</td><td>NA</td><td>300MHz -6GHz; Er = < 5, Loss Tangent = ≤0.05</td><td>Human Model</td></tr>
<tr><td>Oval Flat</td><td>√</td><td>300MHz -6GHz; Er = 4+/- 1, Loss Tangent = ≤0.05</td><td>600x400x190</td></tr>
</table>

8.3 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 10. 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 (percent by mass)
Table 9

Ingredients	450MHz	
	Head	Body
Sugar	56.0	46.5
Diacetin	0	0
De ionized – Water	39.1	50.53
Salt	3.8	1.87
HEC	1.0	1.0
Bact.	0.1	0.1

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
Speag Probe	ES3DV3	3147	4/11/2014	4/11/2015
Speag DAE	DAE3	401	3/11/2014	3/11/2015
Speag Dipole	D450V3	1075	7/23/2013	7/23/2015
Power Meter (Keysight)	E4419B	MY45103725	3/3/2014	3/3/2015
E-Series Avg. Power Sensor (Keysight)	E9301B	MY41495730	4/10/2014	4/10/2015
E-Series Avg. Power Sensor (Keysight)	E9301B	MY41495733	4/10/2014	4/10/2015
Bi-Directional Coupler (NARDA)	3020A	40296	1/31/2014	1/31/2016
Signal Generator (Keysight)	E4428C	MY47381119	6/7/2013	6/7/2015
AMP (Amplifier Research)	10W1000	5924	CNR	CNR
Power Meter (Keysight)	E4418B	GB40206553	3/3/2014	3/3/2015
Power Sensor (Keysight)	8482B	3318A07393	2/4/2014	2/4/2015
Dickson Temperature Recorder	TM325	12121144	5/16/2014	5/16/2015
Omega Digital Thermometer with J Type TC Probe	HH202A	18800	3/3/2014	3/3/2015
Keysight PNA-L Network Analyzer	N5230C	MY49002155	8/4/2014	8/4/2015
Dielectric Probe Kit (DAK1)	DAK-12	1013	5/15/2014	5/15/2015

10.0 SAR Measurement System Validation and Verification

DASY output files of the probe/dipole calibration certificates and system verification test results are included in appendices B, C & D 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		
				σ	ϵ_r	Sensitivity	Linearity	Isotropy
CW								
5/06/2014	Head	450	3147	0.87	43.9	Pass	Pass	Pass
5/06/2014	Body	450		0.93	57.4	Pass	Pass	Pass

10.2 System Verification

System verification checks were conducted each day during the SAR assessment. The results are normalized to 1W. Appendix D 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 D450V3 / 1075	4.51 +/- 10%	1.17	4.68	11/07/2014
				1.19	4.76	11/14/2014
	IEEE/IEC Head		4.73 +/- 10%	1.17	4.68	11/07/2014

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
450	FCC Body	0.94 (0.89-0.99)	56.7 (53.9-59.5)	0.93	54.8	11/07/2014
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.5 (41.3-45.7)	0.87	43.6	11/07/2014
	FCC Body	0.94 (0.89-0.99)	56.7 (53.9-59.5)	0.95	54.9	11/14/2014

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

	Target	Measured
Ambient Temperature	18 – 25 ˚C	Range: 19.7 – 21.3˚C Avg. 20.2 ˚C
Relative Humidity	30 – 70 %	Range: 56.6 – 69.4 % Avg. 62.5 %
Tissue Temperature	NA	Range: 19.9 – 20.1˚C Avg. 20.0˚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. Oval 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

<table>
<tr><th colspan="2">Description</th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="2">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="2">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="2" rowspan="2">Maximum area scan spatial resolution: ΔxArea, ΔyArea</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td colspan="2">Maximum zoom scan spatial resolution: ΔxZoom, ΔyZoom</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td>Maximum zoom scan spatial resolution, normal to phantom surface</td><td>uniform grid: ΔzZoom(n)</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td colspan="4">Note: δ 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.</td></tr>
</table>

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 in order to demonstrate PCII compliance.

12.3 DUT Positioning Procedures

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

12.3.1 Body/Shoulder

- Body: The DUT was positioned in highest applicable configuration against the phantom with the offered body worn accessory.
- Shoulder: The PSM was positioned in the intended use configuration against the phantom with the offered shoulder clip.

12.3.2 Head

Not applicable.

12.3.3 Face

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

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

Where
N_c = Number of channels
F_{high} = Upper channel
F_{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:

$$Max\_Calc = SAR\_meas \cdot 10^{\frac{-Drift}{10}} \cdot \frac{P\_max}{P\_int} \cdot DC$$

P_max = Maximum Power (W)
P_int = Initial Power (W)
Drift = DASY drift results (dB)
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_int > P_max, then P_max/P_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 DUT was assessed at the highest applicable configurations found during the initial compliance assessment on file with the FCC. All tests were performed in CW and 50% duty cycle was applied to PTT configurations in the final results.

13.0 DUT Test Data

13.1 Assessments at the Body

The DUT was assessed at the highest applicable configuration at the body found during the initial compliance assessment on file with the FCC. SAR plots of the highest results are presented in appendix E.

Table 16

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
FAF5259A	PMNN4403B	NTN9179A D-clip and Belt Loop	None	*380.0125							
				*395.0000							
				406.1250	5.48	-0.42	5.12	3.85	**2.88**	**2.17**	ErC-Ab-141107-08
				422.1250							
				438.1250							
				453.9875							
				469.9875							

*These frequencies are outside of the FCC Part 90 frequency range

Assessments at the Body with PSM PMMN4059B and antenna FAF5259A

DUT was tested with PSM PMMN4059B at the highest applicable configuration at the body found during the initial compliance assessment on file with the FCC.

Table 17

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
FAF5259A	PMNN4403B	4205823V01 PSM Belt clip	PMMN4059B	*380.0125							
				*395.0000							
				406.1250							
				422.1250							
				438.1250	5.48	-0.07	7.91	5.68	**4.11**	**2.95**	ErC-Ab-141107-05
				453.9875							
				469.9875							

*These frequencies are outside of the FCC Part 90 frequency range

Assessments at the Body with PSM PMMN4059B and antenna PMAE4065A

DUT was tested with PSM PMMN4059B at the highest applicable configuration at the body found during the initial compliance assessment on file with the FCC.

Table 18

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAE4065A	NNTN7034B	4205823V01 PSM Belt clip	PMMN4059B	*380.0125							
				*395.0000							
				406.1250							
				422.1250							
				438.1250							
				453.9875	5.51	-0.23	9.57	6.86	**5.13**	**3.68**	ErC-Ab-141107-07
				469.9875							

*These frequencies are outside of the FCC Part 90 frequency range

13.2 Assessments at the Face

The DUT was assessed at the highest applicable configuration at the face found during the initial compliance assessment on file with the FCC. SAR plots of the highest results are presented in appendix E.

Table 19

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
FAF5259A	PMNN4403B	None (front)	None	*380.0125							
				*395.0000							
				406.1250	5.48	-0.46	5.54	4.15	**3.15**	**2.36**	ErC-Face-141107-10
				422.1250							
				438.1250							
				453.9875							
				469.9875							

*These frequencies are outside of the FCC Part 90 frequency range

Assessments at the Face with PSM PMMN4059B and antenna FAF5259A

DUT was tested with PSM PMMN4059B at the highest applicable configuration at the face found during the initial compliance assessment on file with the FCC.

Table 20

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
FAF5259A	NNTN7034B	None	PMMN4059B	*380.0125							
				*395.0000							
				406.1250							
				422.1250							
				438.1250							
				453.9875	5.48	-0.16	3.58	2.63	**1.9**	**1.39**	ErC-Face-141107-09
				469.9875							

*These frequencies are outside of the FCC Part 90 frequency range

13.3 Assessment for Industry Canada

Selected test channels were based on the highest applicable configuration at the body and face found during the initial compliance assessment on file with Industry Canada.

13.4 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 F.

Table 21

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAE4065A	NNTN7034B	4205823V01 PSM Belt clip	PMMN4059B	453.9875	5.56	-0.28	10.50	7.34	**5.64**	3.94	ErC-Ab-141114-10

14.0 Simultaneous Transmission Exclusion for BT

Not applicable.

15.0 Results Summary

The highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for this filing: Model H98QDD9PW5AN (NUE1006).

TABLE 22

Designator	Frequency (MHz)	Max Calc at Body (mW/g)		Max Calc at Face (mW/g)	
		1g-SAR	10g-SAR	1g-SAR	10g-SAR
Overall	380-470	5.64	3.68	3.15	2.36
FCC	406.1-470	5.64	3.68	3.15	2.36

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. Degradation of SAR was not observed for this PCII therefore numbers found on initial compliance assessment for FCC and IC remain.

16.0 Variability Assessment

Per the guidelines in KDB 865664 SAR variability assessment is required because SAR results are above 4.0W/kg.
The Table below includes test results of the original measurement, the repeated measurement, and the ratio (SAR_{high}/SAR_{low}) for the applicable test configuration.

Table 23

Run#	Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq. (MHz)	Adj Calc. 1g-SAR (W/kg)	Ratio	Comments
ErC-Ab-141107-07	PMAE4065A	NNTN7034B	4205823V01 PAM Belt clip	PMMN4059B	453.9875	5.05	1.10	No additional repeated scans is required due to the Ratio (SAR_{high}/SAR_{low}) < 1.20
ErC-Ab-141114-10						5.60		

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.

Appendix A
Measurement Uncertainty Budget

Uncertainty Budget for Device Under Test, for 450 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	6.7	N	1.00	1	1	6.7	6.7	∞
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				12	11	482
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				23	23	

Notes for uncertainty budget Tables:
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
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: **ES3-3147_Apr14/2**

CALIBRATION CERTIFICATE (Replacement of No: ES3-3147_Apr14)

Object: ES3DV3 - SN:3147

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: April 11, 2014

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	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 24, 2014

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

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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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
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
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
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 affect 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 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
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: 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 ≤ 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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3147

Manufactured: July 12, 2007
Calibrated: April 11, 2014

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

ES3DV3– SN:3147 April 11, 2014

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μV/(V/m)^2)[A]	1.26	1.20	1.19	± 10.1 %
DCP (mV)[B]	101.3	99.6	100.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	161.8	±3.3 %
		Y	0.0	0.0	1.0		161.7	
		Z	0.0	0.0	1.0		167.5	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.31	70.3	19.4	1.87	131.7	±0.7 %
		Y	2.68	65.5	16.5		130.8	
		Z	3.19	69.3	18.9		138.5	
10013-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	12.25	73.1	24.8	9.46	133.2	±2.7 %
		Y	11.83	71.6	23.6		133.3	
		Z	12.59	73.8	25.3		143.1	
10059-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	3.67	70.9	19.5	2.12	132.1	±0.7 %
		Y	3.28	68.2	17.6		130.7	
		Z	3.90	72.2	20.2		138.7	
10060-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	11.06	91.5	26.9	2.83	121.4	±0.5 %
		Y	5.94	79.3	21.9		119.6	
		Z	12.66	93.5	27.5		128.1	
10061-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	10.64	86.6	25.6	3.60	125.8	±0.9 %
		Y	7.31	78.8	22.1		124.8	
		Z	11.87	88.2	26.1		133.6	
10071-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	12.66	73.9	25.6	9.83	132.1	±3.3 %
		Y	12.19	72.3	24.3		132.0	
		Z	13.12	74.9	26.2		142.4	
10072-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	12.43	74.0	25.5	9.62	130.6	±3.0 %
		Y	11.94	72.5	24.3		130.5	
		Z	12.99	75.3	26.3		140.3	
10073-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	12.84	75.1	26.3	9.94	129.2	±3.0 %
		Y	12.13	72.9	24.7		127.4	
		Z	13.52	76.6	27.2		139.1	
10074-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	13.24	76.0	27.2	10.30	127.5	±3.0 %
		Y	12.42	73.6	25.4		124.8	
		Z	13.92	77.5	28.0		137.1	
10075-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	13.83	77.4	28.3	10.77	125.6	±3.5 %
		Y	12.94	74.8	26.5		124.7	
		Z	13.88	76.9	27.8		136.6	
10076-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	13.92	77.6	28.6	10.94	124.1	±3.3 %
		Y	13.06	75.1	26.8		123.5	
		Z	14.14	77.5	28.2		136.5	

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10077-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	14.08	78.1	28.9	11.00	123.2	±3.8 %
		Y	13.17	75.4	27.0		123.2	
		Z	14.30	77.9	28.5		136.4	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.69	68.4	20.5	5.80	144.6	±1.7 %
		Y	6.60	67.7	19.7		144.7	
		Z	6.11	66.1	19.1		106.8	
10109-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	7.10	66.8	19.8	6.43	106.4	±1.4 %
		Y	6.95	66.0	19.1		106.8	
		Z	7.23	67.2	20.0		112.8	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.36	67.8	20.3	5.75	140.3	±1.4 %
		Y	6.25	67.1	19.4		141.0	
		Z	6.45	68.2	20.4		148.9	
10111-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	7.40	68.4	20.8	6.44	148.9	±1.9 %
		Y	7.34	67.9	20.2		149.7	
		Z	6.87	66.4	19.6		110.2	
10112-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	7.32	66.9	19.9	6.59	107.7	±1.2 %
		Y	7.18	66.2	19.2		108.7	
		Z	7.36	66.9	19.8		114.9	
10113-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	7.13	66.8	20.0	6.62	105.2	±1.4 %
		Y	6.95	65.9	19.1		105.6	
		Z	7.11	66.6	19.7		112.4	
10142-CAB	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	6.22	67.8	20.2	5.73	138.9	±1.4 %
		Y	6.09	66.9	19.4		139.6	
		Z	6.22	67.6	20.0		147.4	
10143-CAB	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	7.18	68.4	20.7	6.35	146.1	±1.7 %
		Y	7.09	67.7	20.0		146.7	
		Z	6.64	66.2	19.4		108.8	
10145-CAB	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	5.92	67.3	20.0	5.76	134.0	±1.2 %
		Y	5.78	66.4	19.1		134.6	
		Z	5.94	67.1	19.8		143.0	
10146-CAB	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	6.89	68.2	20.7	6.41	139.9	±1.4 %
		Y	6.74	67.4	19.9		139.2	
		Z	7.02	68.5	20.9		149.3	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.39	67.9	20.3	5.75	140.3	±1.4 %
		Y	6.23	67.0	19.4		140.8	
		Z	6.45	68.2	20.4		148.7	
10155-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	7.45	68.6	20.9	6.43	149.2	±1.9 %
		Y	7.35	68.0	20.2		150.0	
		Z	6.96	66.8	19.8		110.2	
10156-CAB	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	6.13	67.4	20.1	5.79	137.1	±1.2 %
		Y	6.04	66.8	19.4		138.7	
		Z	6.16	67.4	20.0		145.7	
10157-CAB	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	7.22	68.5	21.0	6.49	144.5	±1.7 %
		Y	7.08	67.7	20.1		145.0	
		Z	6.68	66.4	19.6		107.0	

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10158-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	7.10	66.7	19.8	6.62	105.3	±1.4 %
		Y	6.93	65.8	19.1		105.7	
		Z	7.16	66.7	19.8		111.5	
10159-CAB	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	7.34	68.6	21.0	6.56	146.0	±1.9 %
		Y	7.24	68.0	20.3		147.0	
		Z	6.81	66.5	19.7		108.2	
10166-CAB	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	5.30	66.7	19.6	5.46	129.0	±0.9 %
		Y	5.18	66.0	18.9		129.1	
		Z	5.31	66.6	19.5		136.7	
10167-CAB	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	6.32	68.0	20.5	6.21	133.2	±1.4 %
		Y	6.16	67.2	19.7		131.3	
		Z	6.47	68.5	20.8		141.1	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.14	66.8	19.9	5.72	123.0	±1.2 %
		Y	4.99	66.0	19.0		122.3	
		Z	5.24	67.2	20.1		129.9	
10176-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	6.06	68.3	21.0	6.52	123.9	±1.2 %
		Y	5.78	67.1	19.9		122.2	
		Z	6.21	68.8	21.3		131.1	
10177-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	5.16	66.9	19.9	5.73	123.1	±1.2 %
		Y	5.01	66.0	19.0		122.2	
		Z	5.29	67.4	20.2		129.9	
10178-CAB	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	6.03	68.2	20.9	6.52	123.7	±1.4 %
		Y	5.80	67.1	19.9		122.9	
		Z	6.24	68.9	21.3		131.1	
10179-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	6.09	68.6	21.1	6.50	124.0	±1.2 %
		Y	5.82	67.3	20.0		122.7	
		Z	6.18	68.7	21.2		131.5	
10180-CAB	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	6.08	68.5	21.0	6.50	124.0	±1.4 %
		Y	5.80	67.2	20.0		121.8	
		Z	6.19	68.7	21.2		131.5	
10184-CAB	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	5.17	66.9	20.0	5.73	122.6	±1.2 %
		Y	5.02	66.1	19.1		121.7	
		Z	5.28	67.3	20.1		129.9	
10185-CAB	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	6.03	68.3	21.0	6.51	123.7	±1.4 %
		Y	5.82	67.2	20.0		122.5	
		Z	6.22	68.8	21.3		131.1	
10187-CAB	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	5.21	67.1	20.1	5.73	122.6	±0.9 %
		Y	4.99	65.9	19.0		122.1	
		Z	5.21	66.9	19.9		130.2	
10188-CAB	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	6.05	68.2	21.0	6.52	123.6	±1.2 %
		Y	5.84	67.2	20.0		122.7	
		Z	6.15	68.4	20.9		131.9	
10298-AAA	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	5.99	67.3	20.0	5.72	135.4	±1.2 %
		Y	5.87	66.5	19.2		135.6	
		Z	6.13	67.8	20.3		144.1	

Certificate No: ES3-3147_Apr14/2 Page 6 of 14

ES3DV3– SN:3147 April 11, 2014

10299-AAA	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	7.03	68.4	20.8	6.39	142.1	±1.4 %
		Y	6.90	67.6	20.0		142.6	
		Z	6.63	66.8	19.8		106.0	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.97	69.0	19.1	1.71	131.1	±0.5 %
		Y	2.64	66.0	16.8		131.9	
		Z	2.93	68.8	18.9		138.0	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.67	70.3	22.6	8.36	130.0	±3.0 %
		Y	10.43	69.4	21.7		130.4	
		Z	10.87	70.8	22.8		139.9	

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%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 8 and 9).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
150	52.3	0.76	7.10	7.10	7.10	0.05	1.30	± 13.3 %
220	49.0	0.81	7.00	7.00	7.00	0.07	1.30	± 13.3 %
300	45.3	0.87	7.26	7.26	7.26	0.16	1.90	± 13.3 %
450	43.5	0.87	6.64	6.64	6.64	0.20	2.52	± 13.3 %
750	41.9	0.89	6.23	6.23	6.23	0.32	1.77	± 12.0 %
900	41.5	0.97	5.93	5.93	5.93	0.36	1.69	± 12.0 %
1810	40.0	1.40	5.02	5.02	5.02	0.80	1.13	± 12.0 %
1950	40.0	1.40	4.83	4.83	4.83	0.77	1.17	± 12.0 %
2300	39.5	1.67	4.65	4.65	4.65	0.44	1.68	± 12.0 %
2450	39.2	1.80	4.41	4.41	4.41	0.75	1.23	± 12.0 %
2600	39.0	1.96	4.26	4.26	4.26	0.80	1.29	± 12.0 %
3500	37.9	2.91	4.20	4.20	4.20	0.90	1.13	± 13.1 %
3700	37.7	3.12	4.03	4.03	4.03	0.90	1.18	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restrcted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

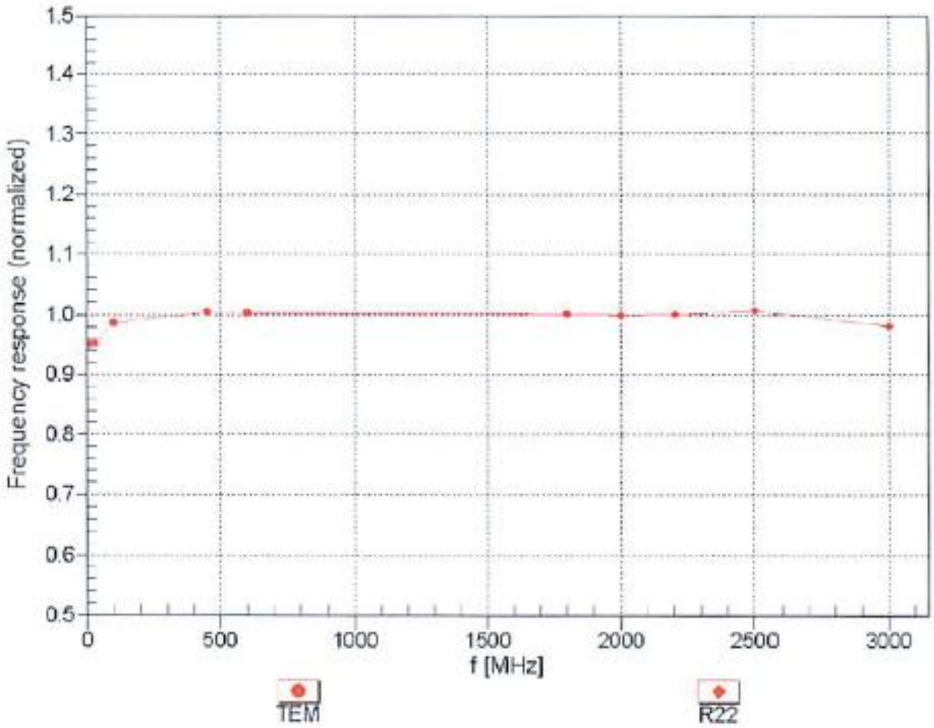
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3147

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
150	61.9	0.80	6.71	6.71	6.71	0.06	1.35	± 13.3 %
220	60.2	0.86	6.66	6.66	6.66	0.05	1.30	± 13.3 %
300	58.2	0.92	7.24	7.24	7.24	0.13	1.00	± 13.3 %
450	56.7	0.94	6.86	6.86	6.86	0.13	2.21	± 13.3 %
750	55.5	0.96	6.07	6.07	6.07	0.36	1.72	± 12.0 %
900	55.0	1.05	5.94	5.94	5.94	0.48	1.47	± 12.0 %
1810	53.3	1.52	4.70	4.70	4.70	0.40	1.70	± 12.0 %
1950	53.3	1.52	4.74	4.74	4.74	0.48	1.69	± 12.0 %
2300	52.9	1.81	4.37	4.37	4.37	0.80	1.18	± 12.0 %
2450	52.7	1.95	4.20	4.20	4.20	0.80	1.07	± 12.0 %
2600	52.5	2.16	4.01	4.01	4.01	0.80	1.06	± 12.0 %
3500	51.3	3.31	3.77	3.77	3.77	0.90	1.25	± 13.1 %
3700	51.0	3.55	3.59	3.59	3.59	0.90	1.28	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restrcted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency banc.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

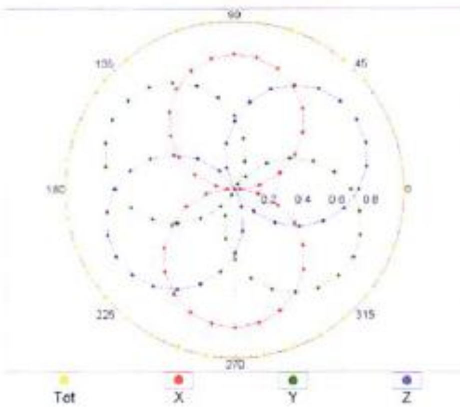
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



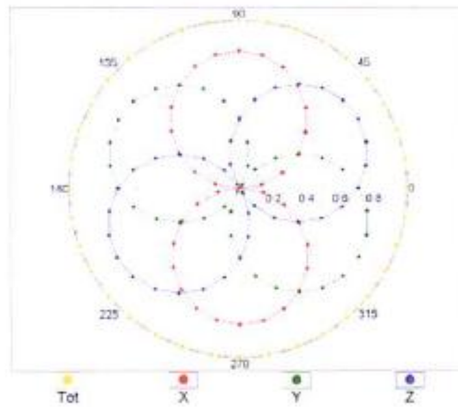
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

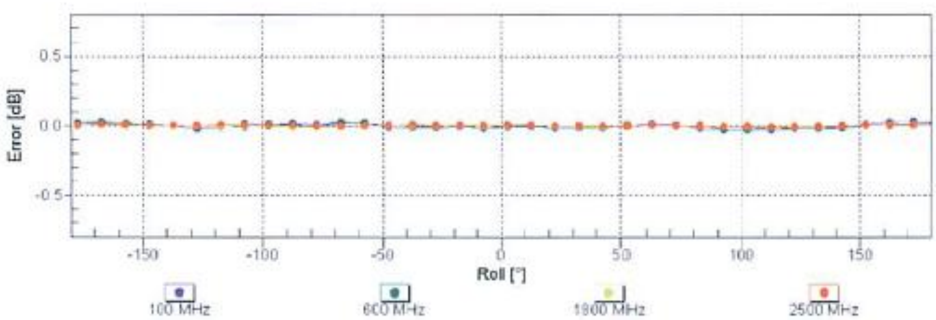
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



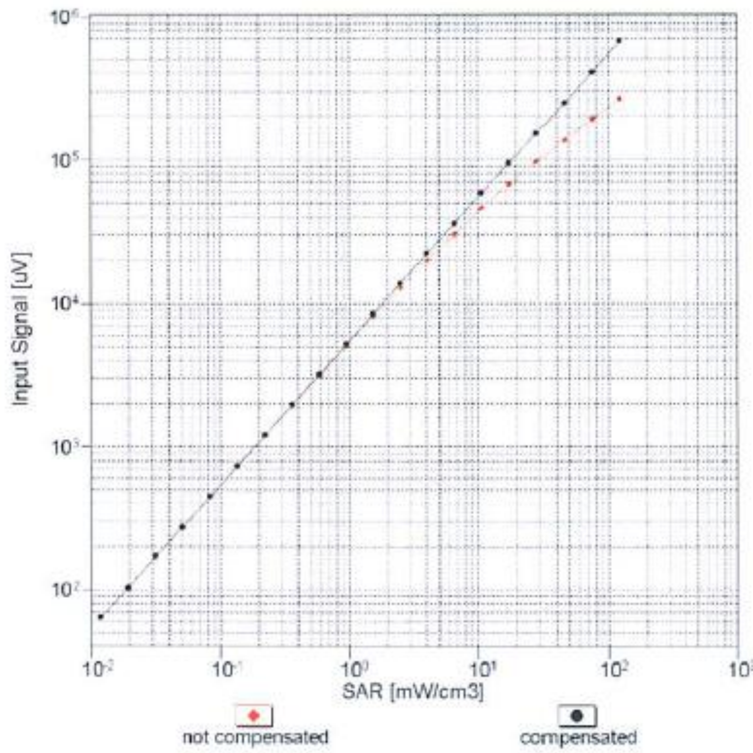
f=1800 MHz,R22

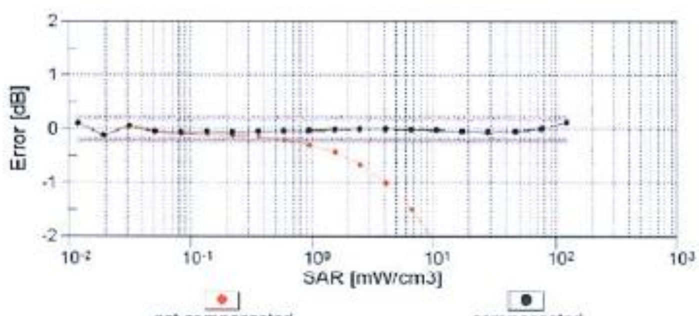




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

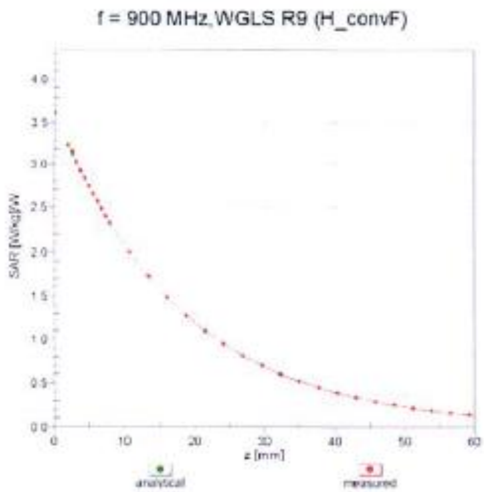
Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

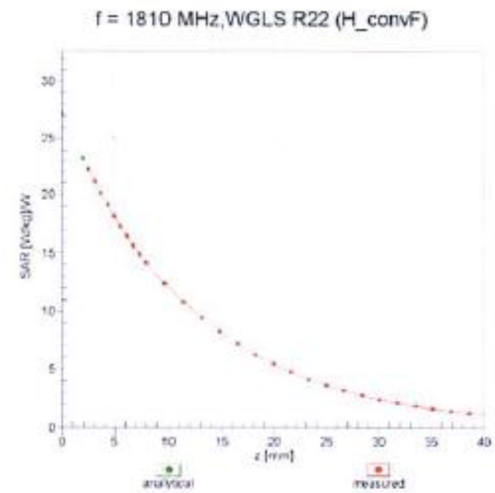




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

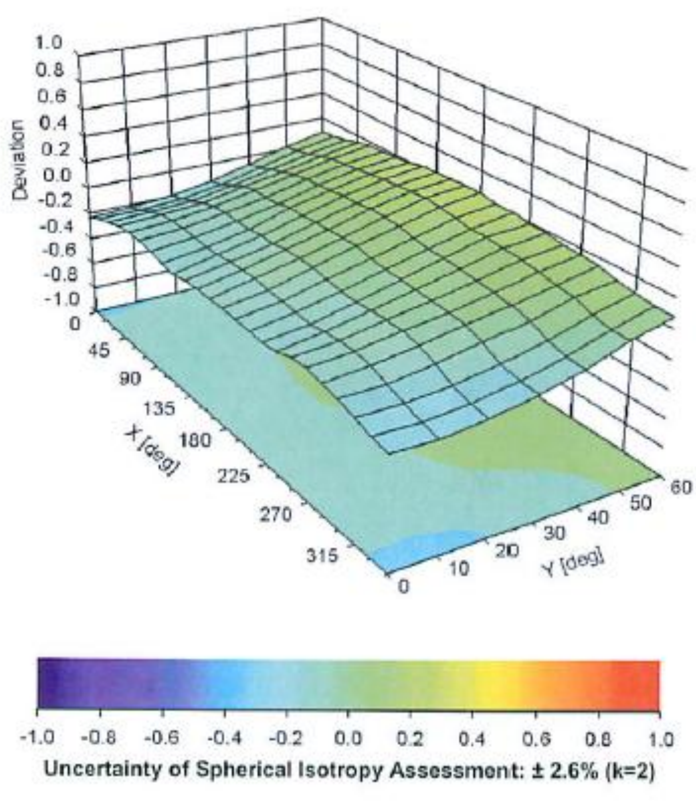
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	12.5
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

Appendix C
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
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: **D450V3-1075_Jul13**

CALIBRATION CERTIFICATE

Object: D450V3 - SN: 1075

Calibration procedure(s): QA CAL-15.v7
Calibration procedure for dipole validation kits below 700 MHz

Calibration date: July 23, 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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
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 ET3DV6	SN: 1507	28-Dec-12 (No. ET3-1507_Dec12)	Dec-13
DAE4	SN: 654	18-Jul-13 (No. DAE4-654_Jul13)	Jul-14

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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 23, 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

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:

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

Additional Documentation:

d) DASY4/5 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	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	43.5	0.87 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	44.0 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**4.73 W/kg ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	0.794 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**3.13 W/kg ± 17.6 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	56.7	0.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.1 ± 6 %	0.95 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**4.51 W/kg ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	0.754 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**2.99 W/kg ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.8 Ω - 2.2 jΩ
Return Loss	- 22.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	56.5 Ω - 4.4 jΩ
Return Loss	- 22.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 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	June 24, 2010

DASY5 Validation Report for Head TSL

Date: 23.07.2013

Test Laboratory: The name of your organization

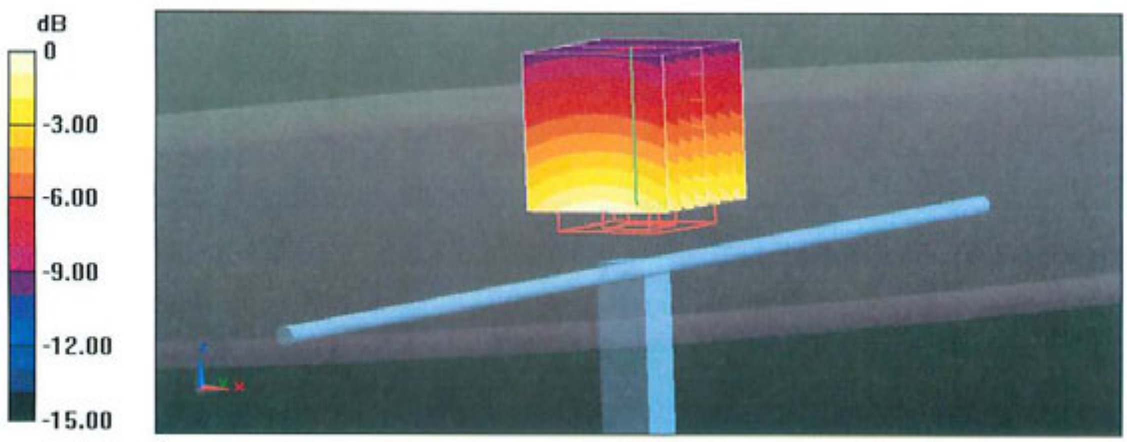
DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN: 1075

Communication System: UID 0 - CW ; Frequency: 450 MHz
Medium parameters used: f = 450 MHz; σ = 0.89 S/m; ε_r = 44; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.59, 6.59, 6.59); Calibrated: 28.12.2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 18.07.2013
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

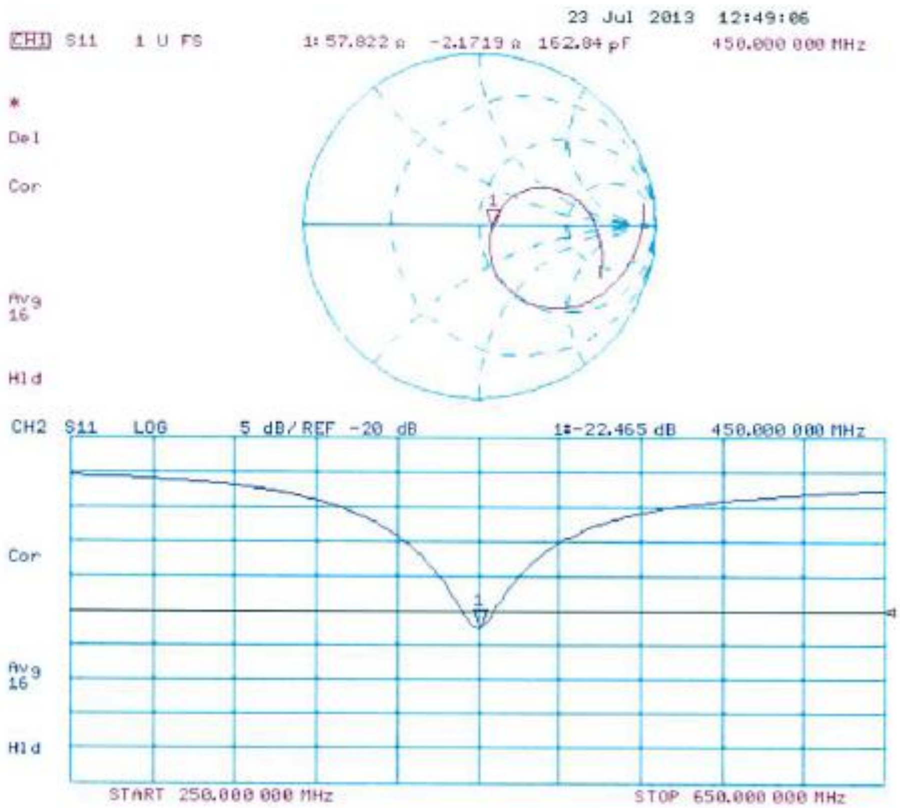
Dipole Calibration for Head Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.426 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.84 W/kg
SAR(1 g) = 1.2 W/kg; SAR(10 g) = 0.794 W/kg
Maximum value of SAR (measured) = 1.28 W/kg



0 dB = 1.28 W/kg = 1.07 dBW/kg

Certificate No: D450V3-1075_Jul13 Page 5 of 8

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.07.2013

Test Laboratory: The name of your organization

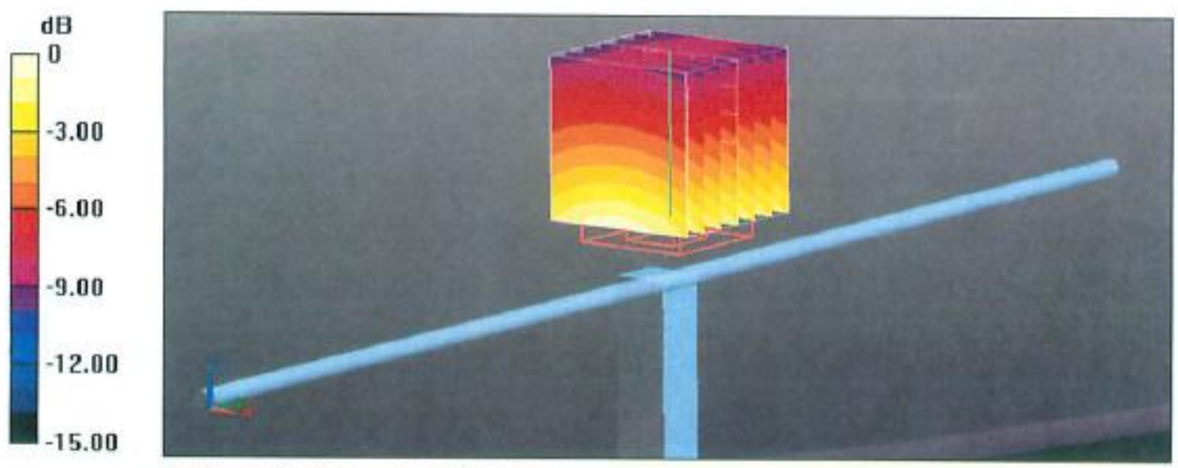
DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN: 1075

Communication System: UID 0 - CW ; Frequency: 450 MHz
Medium parameters used: f = 450 MHz; σ = 0.95 S/m; ε_r = 56.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

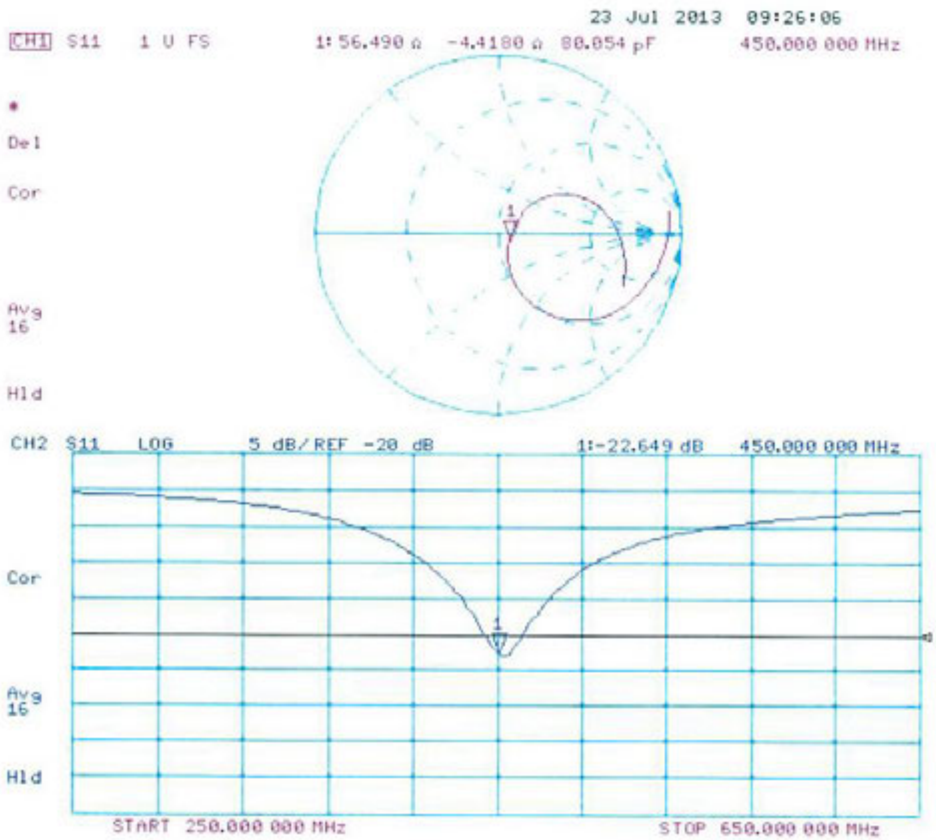
- Probe: ET3DV6 - SN1507; ConvF(7.03, 7.03, 7.03); Calibrated: 28.12.2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 18.07.2013
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.426 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.78 W/kg
SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.754 W/kg
Maximum value of SAR (measured) = 1.22 W/kg



0 dB = 1.22 W/kg = 0.86 dBW/kg

Impedance Measurement Plot for Body TSL



Dipole Data

The table below includes dipole impedance and return loss measurement data measured by Motorola Solutions' EME lab. The results meet the requirements stated in KDB 865664.

Dipole 450-1075	Head			Body		
	Impedance		Return Loss	Impedance		Return Loss
Date Measured	real Ω	imag jΩ	dB	real Ω	imag jΩ	dB
8/12/2013	48.2	7.5	-21.9	52.4	7.5	-22.2
9/23/2014	49.6	7.2	-22.8	52.3	6.7	-23.2