MOTOROLA SOLUTIONS

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TESTING CERT # 2518.05

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

Enterprise Mobility Solutions
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Date of Report: 10/14/2011
Report Revision: A
Report ID: SAR rpt_PMUE3681A_Rev.A _111014_SR9664

Responsible Engineer:	Veeramani Veerapan (Senior EME Engineer)
Report Author:	Veeramani Veerapan (Senior EME Engineer)
Date/s Tested:	6/9/2011 – 7/14/2011
Manufacturer/Location:	Motorola, Penang
Sector/Group/Div.:	EMS
Date submitted for test:	6/03/2011
DUT Description:	403-527 MHz 4W, 2.402-2.480 GHz (Bluetooth), NKP w/BT/GPS GOB
Test TX mode(s):	CW (PTT) for UHF; CW (76.1% duty cycle for Bluetooth)
Max. Power output:	4.8 W for UHF; 10 mW for Bluetooth
Nominal Power:	4.0 W for UHF; 2.5 mW for Bluetooth
Tx Frequency Bands:	403-527 MHz, 2402-2480 MHz
Signaling type:	FM (UHF); FHSS (Bluetooth)
Model(s) Tested:	PMUE3681A
Model(s) Certified:	PMUE3681A
Serial Number(s):	807TMK0007
Classification:	Occupational/Controlled
FCC ID:	ABZ99FT4086; Rule part 90 (406.1 - 512 MHz); Rule part 15 (2402-2480 MHz)
IC:	109AB-99FT4086

* Refer to section 15 of part 1 for highest SAR summary results.

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, 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
EMS EME Lab Senior Resource Manager, Laboratory Director

Approval Date: 10/17/2011

Certification Date: 8/7/2011

Certification No.: L1110808P

Part 1 of 2

Report Revision History

Date	Revision	Comments
7/29/2011	O	Initial release
10/14/2011	A	Appendix D updates on System Verification dipole targets for 2010

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 EMS EME Test Laboratory for model number PMUE3681A.

2.0 Abbreviations / Definitions

CNR: Calibration Not Required
CQPSK**:** Compatible Quadrature Phase-Shift Keying
CW: Continuous Wave
DUT: Device Under Test
FHSS: Frequency Hopping Spread Spectrum
FM: Frequency Modulation
NA: Not Applicable
PTT: Push to Talk
PSM: Public Safety Microphone
TDMA: Time Division Multiple Access
SAR: Specific Absorption Rate

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.

3.0 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 (1999), 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.

4.0 SAR Limits

TABLE 1

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

5.0 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. 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 KDB450824 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.

6.0 Description of Device Under Test (DUT):

This device operates using analog frequency modulation (FM) signaling incorporating traditional simplex two-way radio transmission protocol. This device is also wireless BT compatible.

The device is intended to be used with a maximum duty cycle of 50%. This device also incorporate 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 for Bluetooth is 76.1%.

The model represented under this filing utilizes removable antennas for the 403-527 MHz (UHF) band and fixed internal antenna for 2402-2480 MHz (Bluetooth) band. The nominal output power and maximum output powers for each of the applicable bands are indicated in table 2 below. The max power is defined by upper limit of the production line final test station. The intended operating positions are "at the face" with the DUT or Wireless 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.

TABLE 2

Frequency Band	Nominal Output Power	Maximum Output Power
403-527 MHz	4 W	4.8 W
2402-2480 MHz	2.5 mW	10 mW

7.0 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. The following sections identify the test criteria and details for each accessory category.

7.1 Batteries:

All offered batteries were tested. Table below lists the batteries and their descriptions.

TABLE 3

Battery Models	Description	*Tested	Comments
PMNN4407A	Impres Li Ion Slim Battery 1500mAh	Yes	Height = 114mm
PMNN4409A	Impres Hi Cap Li Ion Non-FM Battery 2150mAh	Yes	Height = 114mm
PMNN4412A	NiMH Core Battery 1300mAh	Yes	Height = 114mm
NNTN8129A	Impres Hi Cap Li Ion FM Battery 2300mAh	Yes	Height = 114mm
PMNN4406A	Core Slim Li Ion 1500mAh	Yes	Height = 114mm

*Refer to Exhibit 7B for antenna separation distances**.**

7.2 Antennas:

All offered antennas were tested. Table below lists the antennas and their descriptions.

TABLE 4

Antenna Models	Description	*Tested
PMAE4068A	403-527MHz, Whip; ¼ wave; 0dBd gain	Yes
PMAE4069A	403-450MHz, Stubby; ¼ wave; -1dBd gain	Yes
PMAE4070A	440-490MHz, Stubby; ¼ wave; -1dBd gain	Yes
PMAE4071A	470-527MHz, Stubby; ¼ wave; -1dBd gain	Yes
0104039J80	IFA Bluetooth (2402-2481 MHz) ¼ wave, -0dBi	Yes

*Refer to Exhibit 7B for antenna separation distances**.**

7.3 Body worn Accessories:

All additional body worn accessories were tested. The table below lists the body worn accessories and their descriptions.

TABLE 5

Body worn Models	Description	*Tested	Comments
RLN4570A	Break-A-Way Chest Pack	Yes	
RLN4815A	Radio pack Universal radiopak & Utility case	Yes	
HLN6602A	Chest pack	Yes	
NTN5243A	Shoulder Carry strap	Yes	Tested with carry cases PMLN5845A
PMLN5845A	Nylon case with 3 inch fixed belt loop - no display	Yes	Tested with NTN5243A carry strap
PMLN7008A	2.5 inch Belt Clip	Yes	
PMLN4651A	2 inch Belt Clip	Yes	

*Refer to Exhibit 7B for antenna separation distances**.**

7.4 Audio Accessories:

All additional audio accessories were tested. The table below lists the audio accessories and their descriptions.

TABLE 6

Audio Acc. Models	Description	Tested	Comments
Remote Speaker Microphone			
PMMN4024A	Small core RSM IP54 3.5MM RX only	Yes	
PMMN4025A	IMPRES Remote Speaker Mic	No	
Head set and Ear Piece w/ Microphone			
PMLN5102A	Core Ultra-Lite head set	Yes	
PMLN5096A	Core Earset D-Shell	Yes	
PMLN5275C	Heavy Duty Headset	Yes	
RLN5881A	IMPRESS 2 wire Surveillance - Beige	Yes	
RLN5880A	IMPRESS 2 wire Surveillance - Black	Yes	
RLN5882A	IMPRESS 2 wire Surveillance w/ translucent tube - Black	Yes	
RLN5883A	IMPRESS 2 wire Surveillance w/ translucent tube - Beige	Yes	
PMLN5097A	IMPRESS 3 wire Surveillance - Black	Yes	
PMLN5106A	IMPRESS 3 wire Surveillance - Beige	Yes	
PMLN5111A	Plus 3 wire – Black- one programmable button	Yes	
PMLN5112A	Plus 3 wire – Beige-one programmable button	Yes	
Receive/Listen Only Earpiece (no microphone)			
RLN5878A	Receive Only, Core 1 Wire Surveillance - black	No	
RLN5879A	Receive Only, Core 1 Wire Surveillance - beige	No	

8.0 Description of Test System:

8.1 Descriptions of Robotics/Probes/Readout Electronics:

The laboratory utilizes a Dosimetric Assessment System (DASY4™) SAR measurement system Version 4.7 build 80 manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The test system consists of a Stäubli RX90L robot, DAE3/DAE4, and ES3DV3 E-field probe. The DASY4™ system is operated per the instructions in the DASY4™ Users Manual. The complete manual is available directly from SPEAG™. All measurement equipment used to assess EME SAR compliance was calibrated according to ISO/IEC 17025 A2LA guidelines. 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)

8.2.1 Dual Flat Phantom

Not Applicable.

8.2.2 SAM Phantom

Not Applicable.

8.2.3 Elliptical Flat Phantom

TABLE 6

Phantom ID (s)	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support Structure Material	Loss Tangent (wood)
ELI4 1103 ELI4 1050 ELI4 1037 ELI4 1028	300MHz -6GHz; Er = 4+/- 1, Loss Tangent = ≤0.05	600x400x190	2mm +/- 0.2mm	Wood	< 0.05

8.3 Description of Simulated Tissue:

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

The sugar based simulate tissue is produced by placing the correct measured amount of De-ionized water into a large container. Each of the dried ingredients are weighed and added to the water carefully to avoid clumping. If the solution has a high sugar concentration the water is pre-heated to aid in dissolving the ingredients. For Diacetin and similar type simulates, sugar and HEC ingredients are not needed. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

The simulated tissue mixture was mixed based on the Simulated Tissue Composition indicated in table 7 below for 450 MHz and 2450MHz. During the daily testing of this product, the applicable mixture was used to measure the Di-electric parameters at 450, 403, 406, 417, 425, 436, 440, 443, 458, 465, 470, 475, 484, 490, 496, 506, 512, 527 MHz frequencies to verify that the Di-electric parameters were within the tolerance of the tissue specifications.

Simulated Tissue Composition (by mass)

TABLE 7

% of listed ingredients	450MHz		2450MHz	
	Head	Body	Head	Body
Sugar	56.0	46.5	0	0
Diacetin	0	0	51	34.5
De ionized -Water	39.1	50.53	48.75	65.20
Salt	3.8	1.87	0.15	.20
HEC	1.0	1.0	0	0
Bact.	0.1	0.1	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 8

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Power Meter	E4418B	MY45100532	10/14/2010	10/14/2011
Power Sensor	8481B	MY41091170	10/14/2010	10/14/2011
Power Meter	E4418B	MY45101014	10/15/2010	10/15/2011
Power Sensor	8481B	SG41090248	11/18/2010	11/18/2011
Power Meter	E4419B	MY40330364	5/20/2011	5/20/2012
Power Sensor	8482B	3318A07546	5/19/2011	5/19/2012
Power Sensor	8482B	3318A07392	5/19/2011	5/19/2012
Signal Generator	E4438C	MY45091014	10/11/2010	10/11/2012
Amplifier	10W1000C	312858	CNR	CNR
Amplifier	5S1G4	312988	CNR	CNR
NARDA Bi-Directional Coupler	3020A	41935	10/19/2010	10/19/2011
NARDA Bi-Directional Coupler	3022	81639	10/19/2010	10/19/2011
Temperature Recording Equipment				
Dickson Temp & RH Data Logger	TM320	6153216	6/1/2011	6/1/2012
Dickson Temp & RH Data Logger	TM320	07260127	11/16/2010	11/16/2011
Thermometer	HH806AU	080307	8/25/2010	8/25/2011
Therm. Probe	80PK-22	9135	6/30/2010	6/30/2011
Therm. Probe	80PK-22	8765	9/3/2010	9/3/2011
Tissue Station				
Network Analyzer (HP)	E5071B	MY42403147	10/11/2010	10/11/2011
Dielectric Probe Kit (HP)	85070E	MY44300183	CNR	CNR
Dipole				
Speag Dipole	D450V3	1054	12/15/2009	12/15/2011
Speag Dipole	D450V3	1053	4/18/2011	4/18/2013
Speag Dipole	D2450V3	782	12/9/2009	12/9/2011

*Equipment used for test dates prior to equipment cal due date.

10.0 SAR Measurement System Verification:

The SAR measurements were conducted with probe model/serial number ES3DV3/SN3122. The system performance check was conducted daily and within 24 hours prior to testing. DASY output files of the probe/dipole calibration certificates and system performance test results are included in appendices B, C, D respectively.

Dipole validation scans using head tissue equivalent medium are provided in APPENDIX D. The EMS EME lab validated the dipole to the applicable IEEE 1528-2003 system performance targets. Within the same day system validation was performed using FCC body tissue parameters to generate the system performance target values for body at the applicable frequency. The results of the EMS EME system performance validation are provided herein.

10.1 Equivalent Tissue Test Results:

Simulated tissue prepared for SAR measurements is measured daily and within 24 hours prior to actual SAR testing to verify that the tissue is within +/- 5% of target parameters at the center of the transmit band. This measurement is done using the applicable equipment indicated in section 9.0. The table below summarizes the measured tissue parameters used for the SAR assessment. Frequencies in blue are outside FCC Part 90.

TABLE 9

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
403	FCC Body	0.93 (0.88 -0.97)	57.2 (54.34– 60.06)	0.89	55.5	6/9/11
				0.89	56.0	7/8/11
	IEEE / IEC Head	0.87 (0.83-0.91)	44.1 (41.89-46.31)	0.83	45.3	6/28/11
				0.83	45.2	6/29/11
406	FCC Body	0.93 (0.88-0.98)	57.1 (54.25-59.96)	0.89	55.4	6/9/11
				0.89	55.4	6/11/11
				0.89	55.6	6/13/11
				0.89	55.6	6/14/11
				0.89	55.4	6/15/11
				0.89	55.3	6/16/11
				0.89	55.3	6/17/11
				0.89	56.1	6/20/11
				0.89	55.8	7/9/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	44.0 (41.8-46.2)	0.83	45.2	6/27/11
				0.83	45.2	6/28/11
417	FCC Body	0.94 (0.89-0.99)	57.0 (54.15-59.85)	0.90	55.3	6/10/11
				0.90	55.2	6/15/11
				0.90	55.9	6/20/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.9 (41.70-46.09)	0.84	44.9	6/29/11
425	FCC Body	0.94 (0.89-0.99)	57.0 (54.15-59.85)	0.91	55.0	6/9/11
				0.91	55.2	6/10/11
				0.91	55.1	6/15/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.8 (41.61-45.99)	0.85	44.7	6/28/11
				0.85	44.7	6/29/11
436	FCC Body	0.94 (0.89-0.99)	56.8 (53.96-59.64)	0.92	55.0	6/10/11
				0.92	54.9	6/15/11
				0.92	55.6	6/20/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.7 (41.51-45.89)	0.86	44.4	6/29/11
440	FCC Body	0.94 (0.89-0.99)	56.8 (53.96-59.64)	0.92	54.9	6/10/11
				0.92	54.8	6/15/11
				0.92	55.3	6/21/11
				0.92	55.3	6/22/11

TABLE 9 (Continued)

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
440	FCC Body	0.94 (0.89-0.99)	56.8 (53.96-59.64)	0.92	55.2	6/23/11
				0.92	54.8	6/24/11
				0.92	54.9	6/25/11
				0.92	54.9	6/26/11
				0.92	55.3	7/8/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.62 (41.44-45.80)	0.86	44.3	6/29/11
443	FCC Body	0.94 (0.89-0.99)	56.77 (53.93-59.61)	0.92	54.7	6/9/11
				0.92	54.9	6/10/11
				0.92	54.8	6/15/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.58 (41.40-45.76)	0.86	44.3	6/28/11
450	FCC Body	0.94 (0.89-0.99)	56.7 (53.9-59.54)	0.93	54.9	6/8/11
				0.93	54.6	6/9/11
				0.93	54.8	6/10/11
				0.93	54.6	6/11/11
				0.93	54.7	6/12/11
				0.93	54.9	6/13/11
				0.93	54.8	6/14/11
				0.93	54.7	6/15/11
				0.93	54.6	6/16/11
				0.93	54.6	6/17/11
				0.93	55.3	6/20/11
				0.93	55.2	6/21/11
				0.93	55.2	6/22/11
				0.93	55.0	6/23/11
				0.93	54.7	6/24/11
				0.93	54.7	6/25/11
				0.93	54.7	6/26/11
				0.93	55.0	6/27/11
				0.93	55.2	7/8/11
				0.93	55.0	7/9/11
				0.93	55.2	7/10/11
				0.93	55.1	7/14/11
	IEEE / IEC Head	0.87 (0.83-0.91)	43.5 (41.33-45.68)	0.87	44.1	6/28/11
				0.87	44.1	6/29/11
				0.87	43.4	7/11/11
458	FCC Body	0.94 (0.89-0.99)	56.67 (53.84-59.50)	0.94	54.5	6/9/11
				0.94	54.6	6/10/11
				0.93	54.5	6/11/11
				0.93	54.7	6/13/11
				0.94	54.7	6/14/11
				0.94	54.5	6/15/11
				0.94	54.5	6/16/11
				0.94	54.5	6/17/11

TABLE 9 (Continued)

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
458	FCC Body	0.94 (0.89-0.99)	56.67 (53.84-59.50)	0.94	55.2	6/20/11
				0.94	55.0	6/21/11
				0.93	55.0	6/22/11
				0.94	54.9	6/23/11
				0.93	55.1	7/8/11
				0.93	54.9	7/9/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.46 (41.29-45.63)	0.87	44.0	6/28/11
				0.88	43.9	6/29/11
465	FCC Body	0.94 (0.89-0.99)	56.64 (53.81-59.47)	0.94	54.4	6/9/11
				0.94	54.5	6/10/11
				0.94	54.4	6/11/11
				0.94	54.5	6/12/11
				0.94	54.6	6/13/11
				0.94	54.6	6/14/11
				0.94	54.8	7/14/11
				0.94	54.4	6/15/11
				0.94	54.4	6/16/11
				0.94	54.4	6/17/11
				0.94	55.1	6/20/11
				0.94	54.9	6/21/11
				0.94	54.9	6/22/11
				0.94	54.8	6/23/11
				0.94	54.5	6/24/11
				0.94	54.5	6/25/11
				0.94	54.5	6/26/11
				0.94	55.0	7/8/11
				0.94	54.8	7/9/11
				0.94	54.9	7/10/11
				0.94	54.9	7/11/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.42 (41.25-45.59)	0.88	43.9	6/28/11
				0.88	43.8	6/29/11
				0.85	43.2	7/7/11
				0.88	43.1	7/10/11
				0.88	43.1	7/11/11
470	FCC Body	0.94 (0.89-0.99)	56.6 (53.77-59.43)	0.95	54.6	6/8/11
				0.95	54.5	6/10/11
				0.94	54.3	6/16/11
				0.95	54.3	6/17/11
				0.94	55.0	6/20/11
				0.95	54.9	6/21/11
				0.95	54.9	6/22/11
				0.94	54.7	7/9/11
				0.95	54.9	7/10/11

TABLE 9 (Continued)

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
470	IEEE/ IEC Head	0.87 (0.83-0.91)	43.4 (41.23-45.57)	0.88	43.7	6/29/11
475	FCC Body	0.94 (0.89-0.99)	56.6 (53.77-59.43)	0.95	54.3	6/9/11
				0.95	54.4	6/10/11
				0.95	54.4	6/12/11
				0.95	54.5	6/13/11
				0.95	54.3	6/15/11
				0.95	54.8	6/22/11
				0.95	54.7	6/23/11
				0.95	54.3	6/24/11
				0.95	54.3	6/25/11
				0.95	54.4	6/26/11
				0.95	54.7	6/27/11
				0.95	54.8	7/8/11
				0.95	54.7	7/9/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.4 (41.23-45.57)	0.89	43.7	6/28/11
				0.89	43.6	6/29/11
484	FCC Body	0.94 (0.89-0.99)	56.6 (53.77-59.43)	0.96	54.2	6/9/11
				0.96	54.3	6/10/11
				0.96	54.2	6/15/11
				0.96	54.1	6/16/11
				0.96	54.1	6/17/11
				0.95	54.8	6/20/11
				0.96	54.7	6/21/11
				0.96	54.7	6/22/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.3 (41.14-45.47)	0.90	43.5	6/28/11
				0.89	43.4	6/29/11
490	FCC Body	0.94 (0.89-0.99)	56.5 (53.68-59.33)	0.96	54.2	6/10/11
				0.96	54.1	6/12/11
				0.96	54.3	6/13/11
				0.96	54.2	6/14/11
				0.96	54.1	6/15/11
				0.96	54.6	6/21/11
				0.96	54.5	6/23/11
				0.96	54.2	6/24/11
				0.96	54.1	6/25/11
				0.96	54.2	6/26/11
				0.96	54.5	6/27/11
				0.96	54.6	7/8/11
				0.96	54.5	7/9/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.3 (41.14-45.47)	0.90	43.3	6/29/11

TABLE 9 (Continued)

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
496	FCC Body	0.94 (0.89-0.99)	56.5 (53.68-59.33)	0.97	54.0	6/9/11
				0.97	54.2	6/10/11
				0.96	53.9	6/16/11
				0.97	54.5	6/21/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.3 (41.14-45.47)	0.91	43.4	6/28/11
				0.90	43.2	6/29/11
506	FCC Body	0.94 (0.89-0.99)	56.48 (53.66-59.30)	0.98	53.9	6/9/11
				0.97	53.9	6/11/11
				0.97	54.1	6/13/11
				0.98	54.0	6/14/11
				0.97	53.9	6/15/11
				0.97	54.5	6/20/11
				0.97	54.3	7/9/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.21 (41.05-45.37)	0.91	43.3	6/27/11
512	FCC Body	0.94 (0.89-0.99)	56.46 (53.64-59.28)	0.98	53.8	6/9/11
				0.98	54.0	6/10/11
				0.98	53.9	6/12/11
				0.98	54.0	6/13/11
				0.98	53.9	6/14/11
				0.98	53.8	6/15/11
				0.98	54.3	6/21/11
				0.98	54.2	7/9/11
	IEEE/ IEC Head	0.87 (0.83-0.91)	43.2 (41.04-45.36)	0.88	42.2	6/28/11
				0.89	42.3	6/29/11
527	FCC Body	0.95 (0.90-0.99)	56.40 (53.58-59.22)	0.99	53.7	6/9/11
				0.99	53.8	6/10/11
				0.99	54.2	7/8/11
	IEEE/ IEC Head	0.88 (0.84-0.92)	43.1 (40.95-45.26)	0.90	42.0	6/28/11
				0.91	42.0	6/29/11
2450	FCC Body	1.95 (1.76-2.15)	52.7 (47.4-60.0)	2.00	47.6	7/13/11
2441	FCC Body	1.94 (1.75-2.13)	52.7 (47.4-60.0)	1.98	47.7	7/13/11

10.2 System Check Test Results:

System performance checks were conducted each day during the SAR assessment. The results are normalized to 1W. APPENDIX D explains how the targets were set and 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 10

Probe Serial #	Tissue Type	Probe Cal Date	Dipole Kit / Serial #	Reference SAR @ 1W (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Tested Date
3122	FCC Body	4/14/2011	SPEAG D450V3 / 1054	4.38+/- 10%	4.00	6/9/11
					4.18	6/10/11
			SPEAG D450V3 / 1053	4.48+/- 10%	4.42	6/11/11
					4.42	6/12/11
					4.42	6/13/11
					4.42	6/14/11
					4.46	6/15/11
					4.50	6/16/11
					4.46	6/17/11
					4.38	6/20/11
					4.46	6/21/11
					4.46	6/22/11
					4.42	6/23/11
					4.46	6/24/11
					4.38	625/11
					4.46	6/26/11
					4.42	6/27/11
					4.46	7/8/11
					4.46	7/9/11
					4.46	7/10/11
					4.46	7/14/11
	IEEE/ IEC Head		SPEAG D450V3 / 1053	4.59+/- 10%	4.75	6/28/11
					4.79	6/29/11
					4.68	7/11/11
	FCC Body		SPEAG D2450V3 / 782	52.0 +/- 10%	56.4	7/13/11

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

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^{o}C of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was at least 15cm. Additional precautions are routinely taken to ensure the stability of the simulated tissue such as covering the phantoms when scans are not actively in process in order to minimize evaporation. The lab environment is continuously monitored. The table below presents the range and average environmental conditions during the SAR tests reported herein:

TABLE 11

	Target	Measured
Ambient Temperature	18 - 25 ˚C	Range: 21.1-23.6˚C Avg. 22.4˚C
Relative Humidity	30 - 70 %	Range: 41.8-55.3% Avg. 48.6%
Tissue Temperature	NA	Range: 20.4-21.8˚C Avg. 21.1C

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 Methodology

12.1 Measurements

SAR measurements were performed using the DASY system described in section 8.0 using coarse and 5x5x7 zoom scan. Elliptical flat phantoms filled with applicable simulated tissue were used for body and face testing.

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 D01.

12.3 DUT Positioning Procedures

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

12.3.1 Body:

The DUT was positioned in intended use configuration against the phantom with the offered body worn and audio accessories where 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 the following equation.

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

Where
N_c = Number of channels
F_{high} = Upper channel
F_{low} = Lower channel
F_c = Center channel

12.5 DUT Test Plan:

The guidelines and requirements outlined in "SAR Test Reduction Considerations for Occupational PTT Radios" FCC KDB 643646 D01 dated 4/4/11 for head (face) and body 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.
Tests at the body without the offered audio accessory are to satisfy intended use operation with offered wireless BT accessories. In some cases the initial power listed herein may exceed the reported maximum power due to software step size tuning limitations. However, the initial powers measured are not greater than the allowed 5% of the reported maximum power. BT tests were performed in CW mode and the final results were scaled to the max duty cycle of 77% noted in section 6.0.

Note that test results that are outside the relevant FCC frequency allocations are presented herein in blue font. Tests outside Part 90 allocation were performed using the highest configuration for both body and face.

13.0 DUT Test Data

13.1 Assessment at the Body – Radio power output:

The battery PMNN4407A was selected as default battery to assess at the Body since it is the higher power among the thinnest batteries (refers to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within part 90 frequency range (406.1-512MHz) using the battery PMNN4407A is indicated in the table 15. The channel with highest conducted power will be identified as default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01.

TABLE 15

Test Freq (MHz)	Power (W)
406.125	4.88
417.5	4.83
425.5	4.82
436	4.87
440	4.84
443	4.87
450	4.85
458	4.80
465	4.88
470	4.81
475	4.82
484	4.84
490	4.86
496	4.87
506.3	4.89
512	4.88

13.2 Assessment at the Body with Body-worn PMLN4651A:

Assessment of offered antennas with the default battery and body-worn accessory PMLN4651A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to table 15 for highest output power channel. Highest SAR results from each table are bolded. SAR plots of the highest results are presented in appendix E-G.

TABLE 16

Assessments at the Body (CW mode)											
Antenna	**Battery**	**Carry Accessory**	**Additional attachments**	**Test Freq. (MHz)**	**Initial Power (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#**
PMAE4068A (403-527 MHz)	PMNN4407A	PMLN4651A Belt Clip	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30	4.91	-0.551	3.930	2.780	2.23	1.58	CcC-AB-110611-02
				512.00							
PMAE4069A (403-450 MHz)	PMNN4407A	PMLN4651A Belt Clip	PMMN4024A RSM	406.125	4.88	-0.395	5.487	3.937	3.00	2.16	CcC-AB-110611-03
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4407A	PMLN4651A Belt Clip	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				465.00	4.87	-0.679	8.906	6.332	5.21	3.70	CcC-AB-110611-04
				458.00	4.87	-0.462	9.061	6.441	**5.04**	**3.58**	CcC-AB-110611-05
				470.00							
				475.00	4.83	-0.790	7.130	5.060	4.28	3.03	PS-AB-110612-02
				490.00	4.89	-0.738	5.140	3.650	3.05	2.16	PS-AB-110612-05
PMAE4071A (470-527 MHz)	PMNN4407A	PMLN4651A Belt Clip	PMMN4024A RSM	470.00							
				475.00							
				484.00							
				490.00	4.93	-0.793	5.820	4.140	3.49	2.48	PS-AB-110612-07
				496.00							
				506.30							
				512.00	4.95	-0.595	6.510	4.640	3.73	2.66	PS-AB-110612-06

Assessment of the worst case antenna from above with body-worn accessory PMLN4651A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories.

TABLE 17

Assessments at the Body (CW mode)											
Antenna	**Battery**	**Carry Accessory**	**Additional attachments**	**Test Freq. (MHz)**	**Initial Power (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#**
PMAE4070A (440-490 MHz)	PMNN4406A	PMLN4651A Belt Clip	PMMN4024A RSM	465.00	4.84	-0.671	7.355	5.282	4.29	3.08	PS-AB-110612-08
	PMNN4409A				4.78	-0.473	7.485	5.342	4.19	2.99	PS-AB-110612-09
	PMNN4412A				4.69	-0.495	7.865	5.632	**4.51**	**3.23**	PS-AB-110612-10
	NNTN8129A				4.74	-0.573	7.184	5.152	4.15	2.98	PS-AB-110612-11

13.3 Assessment at the Body with Body-worn PMLN7008A:

Assessment of offered antennas with the default battery and body-worn PMLN7008A accessory per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to table 15 for highest output power channel.

TABLE 18

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	PMLN7008A Belt Clip	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30	4.98	-0.581	3.880	2.740	2.22	1.57	CcC-AB-110613-02
				512.00							
PMAE4069A (403-450 MHz)	PMNN4407A	PMLN7008A Belt Clip	PMMN4024A RSM	406.125	4.93	-0.439	5.242	3.734	2.90	2.07	CcC-AB-110613-03
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4407A	PMLN7008A Belt Clip	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00	4.81	-0.495	8.910	6.291	4.99	3.53	CcC-AB-110613-05
				465.00	4.82	-0.697	8.565	6.082	**5.03**	**3.57**	CcC-AB-110613-04
				470.00							
				475.00	4.84	-0.780	7.140	5.040	4.27	3.02	CcC-AB-110613-06
				484.00							
				490.00	4.87	-0.696	5.170	3.660	3.03	2.15	CcC-AB-110613-07

TABLE 18 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4071A (470-527 MHz)	PMNN4407A	PMLN7008A Belt Clip	PMMN4024A RSM	470.00							
				475.00							
				484.00							
				490.00	4.84	-0.685	5.800	4.120	3.40	2.41	CcC-AB-110613-09
				496.00							
				506.30							
				512.00	4.93	-0.559	6.560	4.640	3.73	2.64	CcC-AB-110613-08

Assessment of the worst case from above with body-worn accessory PMLN7008A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories.

TABLE 19

Assessments at the Body (CW mode)											
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#**
PMAE4070A (440-490 MHz)	PMNN4406A	PMLN7008A Belt Clip	PMMN4024A RSM	465.00	4.80	-0.581	7.315	5.252	4.18	3.00	CcC-AB-110613-10
	PMNN4409A				4.80	-0.611	7.405	5.292	4.26	3.05	Lee-AB-110613-11
	PMNN4412A				4.73	-0.548	7.865	5.602	**4.53**	**3.22**	Lee-AB-110613-12
	NNTN8129A				4.78	-0.568	7.034	5.042	4.03	2.89	Lee-AB-110613-13

13.4 Assessment at the Body with Body-worn PMLN5845A:

Assessment of offered antennas with the default battery and body-worn PMLN5845A accessory per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to table 15 for highest output power channel.

TABLE 20

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30	4.98	-1.220	3.300	2.420	2.19	1.60	Lee-AB-110613-16
				512.00							
PMAE4069A (403-450 MHz)	PMNN4407A	PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	406.125	4.93	-0.346	5.191	3.795	2.81	2.05	Lee-AB-110613-17
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4407A	PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00	4.87	-0.446	8.417	6.210	4.66	3.44	PS-AB-110613-19
				465.00	4.88	-0.675	8.165	6.032	**4.77**	**3.52**	PS-AB-110613-18
				470.00							
				475.00	4.87	-0.856	6.700	4.970	4.08	3.03	PS-AB-110613-20
				484.00							
				490.00	4.91	-1.420	4.490	3.290	3.11	2.28	Lee-AB-110614-02
PMAE4071A (470-527 MHz)	PMNN4407A	PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00	4.99	-0.556	6.030	4.460	3.43	2.53	Lee-AB-110614-03

Assessment of the worst case antenna from above with body-worn accessory PMLN5845A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories.

TABLE 21

Assessments at the Body (CW mode)											
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#**
PMAE4070A (440-490 MHz)	PMNN4406A	PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	465.00	4.86	-0.739	6.584	4.922	3.90	2.92	Lee-AB-110614-04
	PMNN4409A				4.80	-0.544	6.874	5.092	3.90	2.89	Lee-AB-110614-05
	PMNN4412A				4.78	-0.629	7.265	5.402	**4.22**	**3.14**	Lee-AB-110614-06
	NNTN8129A				4.75	-0.693	6.554	4.852	3.88	2.88	Lee-AB-110614-07

13.5 Assessment at the Body with Body-worn RLN4815A:

Assessment of offered antennas with the default battery and body-worn RLN4815A accessory per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to table 15 for highest output power channel.

TABLE 22

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	RLN4815A	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30	4.99	-0.777	2.720	2.000	1.63	1.20	Lee-AB-110614-08
				512.00							
PMAE4069A (403-450 MHz)	PMNN4407A	RLN4815A	PMMN4024A RSM	406.125	4.97	-0.367	4.128	3.046	2.25	1.66	Lee-AB-110614-09
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							

TABLE 22 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4070A (440-490 MHz)	PMNN4407A	RLN4815A	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00							
				465.00	4.86	-0.655	6.304	4.672	**3.67**	**2.72**	PS-AB-110614-10
				470.00							
				475.00							
				484.00							
				490.00	4.91	-0.962	3.470	2.560	2.17	1.60	PS-AB-110614-11
PMAE4071A (470-527 MHz)	PMNN4407A	RLN4815A	PMMN4024A RSM	470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00	5.01	-0.579	4.230	3.120	2.42	1.78	PS-AB-110614-12

Assessment of the worst case antenna from above with body-worn accessory RLN4815A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories.

TABLE 23

Assessments at the Body (CW mode)											
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#**
PMAE4070A (440-490 MHz)	PMNN4406A	RLN4815A	PMMN4024A RSM	465.00	4.81	-0.711	5.874	4.372	**3.46**	**2.57**	CcC-AB-110714-02
	PMNN4409A				4.76	-0.618	5.493	4.091	3.19	2.38	CcC-AB-110714-03
	PMNN4412A				4.72	-0.549	5.714	4.262	3.30	2.46	CcC-AB-110714-04
	NNTN 8129A				4.71	-0.528	5.323	3.971	3.06	2.29	CcC-AB-110714-05

13.6 Assessment at the Body with Body-worn RLN4570A:

Assessment of offered antennas with the default battery and body-worn RLN4570A accessory per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to table 15 for highest output power channel.

TABLE 24

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	RLN4570A	PMMN4024A RSM	406.125	4.93	-0.611	8.645	6.133	4.98	3.53	CcC-AB-110615-03
				417.50							
				425.50	4.89	-0.652	7.825	5.542	4.55	3.22	CcC-AB-110615-04
				436.00							
				440.00							
				443.00	4.93	-0.569	8.121	5.763	4.63	3.28	CcC-AB-110615-06
				450.00							
				458.00							
				465.00	4.85	-0.818	5.894	4.182	3.56	2.52	CcC-AB-110615-05
				470.00							
				475.00							
				484.00	4.88	-1.240	4.700	3.300	3.13	2.20	PS-AB-110615-10
				490.00							
				496.00							
				506.30	4.98	-0.713	6.050	4.240	3.56	2.50	CcC-AB-110615-02
				512.00							
PMAE4069A (403-450 MHz)	PMNN4407A	RLN4570A	PMMN4024A RSM	406.125	4.95	-0.574	7.980	5.637	4.55	3.22	PS-AB-110615-11
				417.50	4.85	-0.355	6.026	4.232	3.27	2.30	PS-AB-110615-12
				425.50							
				436.00	4.67	-0.345	5.400	3.800	3.00	2.11	PS-AB-110615-13
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz	PMNN4407A	RLN4570A	PMMN4024A RSM	440.00	4.88	-0.404	9.795	6.929	5.37	3.80	PS-AB-110615-15
				443.00							
				450.00	4.90	-0.419	11.762	8.366	6.48	4.61	PS-AB-110615-16
				458.00	4.84	-0.639	12.404	8.842	7.19	5.12	PS-AB-110615-17
				465.00	4.89	-0.699	11.507	8.123	6.76	4.77	PS-AB-110615-14
				470.00							
				475.00	4.85	-0.910	8.690	6.180	5.36	3.81	PS-AB-110615-18
				484.00							
				490.00	4.90	-0.889	6.830	4.810	4.19	2.95	PS-AB-110615-19
PMAE4071A (470-527 MHz)	PMNN4407A	RLN4570A	PMMN4024A RSM	470.00	4.80	-0.697	12.010	8.554	**7.05**	**5.02**	CcC-AB-110616-05
				475.00							
				484.00	4.82	-0.821	8.860	6.280	5.35	3.79	CcC-AB-110616-04
				490.00	4.88	-0.705	7.830	5.540	4.61	3.26	CcC-AB-110616-03
				496.00	4.98	-0.703	7.450	5.260	4.38	3.09	CcC-AB-110616-02
				506.30							
				512.00	4.98	-0.611	9.020	6.470	5.19	3.72	PS-AB-110615-20

Assessment of the offered antennas and body-worn accessory RLN4570A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories.

TABLE 25

Assessments at the Body (CW mode)											
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#
PMAE4068A (403-527 MHz)	PMNN4406A	RLN4570A	PMMN4024A RSM	406.125	4.87	-0.434	7.224	5.060	3.99	2.80	CcC-AB-110616-06
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4069A (403-450 MHz)	PMNN4406A	RLN4570A	PMMN4024A RSM	406.125	4.89	-0.602	7.439	5.263	4.27	3.02	CcC-AB-110616-07
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4406A	RLN4570A	PMMN4024A RSM	440.00							
				443.00							
				450.00	4.89	-0.436	10.053	7.172	5.56	3.96	CcC-AB-110616-09
				458.00	4.84	-0.581	10.203	7.291	5.83	4.17	CcC-AB-110616-08
				465.00	4.85	-0.731	8.695	6.232	5.14	3.69	CcC-AB-110616-10
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4406A	RLN4570A	PMMN4024A RSM	470.00	4.79	-0.713	9.278	6.643	5.48	3.92	PS-AB-110616-14
				475.00							
				484.00	4.84	-0.693	6.250	4.480	3.67	2.63	PS-AB-110616-15
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4068A (403-527 MHz)	PMNN4409A	RLN4570A	PMMN4024A RSM	406.125	4.84	-0.687	7.061	5.111	4.14	2.99	PS-AB-110616-19
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							

TABLE 25 (Continued)

Assessments at the Body (CW mode)											
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#
PMAE4069A (403-450 MHz)	PMNN4409A	RLN4570A	PMMN4024A RSM	406.125	4.81	-0.494	6.908	5.010	3.87	2.81	PS-AB-110616-20
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4409A	RLN4570A	PMMN4024A RSM	440.00							
				443.00							
				450.00	4.85	-0.256	9.510	6.881	5.04	3.65	PS-AB-110616-22
				458.00	4.85	-0.445	10.503	7.591	5.82	4.21	PS-AB-110616-21
				465.00	4.79	-0.664	9.686	7.003	5.65	4.09	CcC-AB-110617-02
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4409A	RLN4570A	PMMN4024A RSM	470.00	4.75	-0.620	10.500	7.550	6.12	4.40	CcC-AB-110617-06
				475.00							
				484.00	4.79	-0.902	7.650	5.510	4.72	3.40	CcC-AB-110617-07
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4068A (403-527 MHz)	PMNN4412A	RLN4570A	PMMN4024A RSM	406.125	4.78	-0.526	7.388	5.303	4.19	3.01	PS-AB-110617-11
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4069A (403-450 MHz)	PMNN4412A	RLN4570A	PMMN4024A RSM	406.125	4.81	-0.509	7.132	5.101	4.01	2.87	PS-AB-110617-12
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4412A	RLN4570A	PMMN4024A RSM	440.00	4.80	-0.320	8.462	6.074	4.55	3.27	PS-AB-110617-16
				443.00							
				450.00	4.89	-0.420	10.355	7.483	5.70	4.12	PS-AB-110617-14
				458.00	4.83	-0.694	11.004	7.942	6.46	4.66	PS-AB-110617-13
				465.00	4.78	-0.600	9.586	6.923	5.53	3.99	PS-AB-110617-15
				470.00							
				475.00							
				484.00							
				490.00							

TABLE 25 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4071A (470-527 MHz)	PMNN4412A	RLN4570A	PMMN4024A RSM	470.00	4.77	-0.803	10.700	7.760	**6.48**	**4.70**	PS-AB-110617-19
				475.00							
				484.00	4.83	-0.706	7.840	5.650	4.61	3.32	PS-AB-110617-20
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4068A (403-527 MHz)	NNTN8129A	RLN4570A	PMMN4024A RSM	406.125	4.72	-0.606	6.724	4.827	3.93	2.82	PS-AB-110620-03
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4069A (403-450 MHz)	NNTN8129A	RLN4570A	PMMN4024A RSM	406.125	4.72	-0.476	6.724	4.787	3.82	2.72	PS-AB-110620-04
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	NNTN8129A	RLN4570A	PMMN4024A RSM	440.00							
				443.00							
				450.00	4.77	-0.252	8.746	6.269	4.66	3.34	PS-AB-110620-06
				458.00	4.70	-0.492	9.593	6.911	5.49	3.95	PS-AB-110620-05
				465.00							
				465.00	4.72	-0.554	9.086	6.562	5.25	3.79	PS-AB-110620-07
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	NNTN8129A	RLN4570A	PMMN4024A RSM	470.00	4.76	-0.862	9.388	6.753	5.77	4.15	CcC-AB-110620-11
				475.00							
				484.00	4.78	-0.984	6.990	5.020	4.40	3.16	CcC-AB-110620-12
				490.00							
				496.00							
				506.30							
				512.00							

13.7 Assessment at the Body with Body-worn HLN6602A:

Assessment of offered antennas with the default battery and body-worn HLN6602A accessory per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to table 15 for highest output power channel.

TABLE 26

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	HLN6602A	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30	4.97	-0.582	5.270	3.730	3.01	2.13	CcC-AB-110620-16
				512.00							
PMAE4069A (403-450 MHz)	PMNN4407A	HLN6602A	PMMN4024A RSM	406.125	4.92	-0.620	7.388	5.242	4.26	3.02	CcC-AB-110620-17
				417.50	4.85	-0.725	5.477	3.879	3.24	2.29	CcC-AB-110620-18
				425.50							
				436.00	4.96	-0.454	5.037	3.569	2.80	1.98	CcC-AB-110620-19
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4407A	HLN6602A	PMMN4024A RSM	440.00	4.84	-0.396	8.634	6.124	4.73	3.35	PS-AB-110621-02
				443.00							
				450.00	4.90	-0.398	11.059	7.824	6.06	4.29	PS-AB-110621-03
				458.00	4.82	-0.596	11.104	7.922	6.37	4.54	CcC-AB-110620-21
				465.00	4.84	-0.627	10.206	7.313	5.90	4.22	CcC-AB-110620-20
				465.00							
				475.00	4.80	-0.686	7.960	5.680	4.66	3.33	CcC-AB-110620-22
				484.00							
				490.00	4.88	-1.050	5.930	4.180	3.78	2.66	PS-AB-110621-04
PMAE4071A (470-527 MHz)	PMNN4407A	HLN6602A	PMMN4024A RSM	470.00	4.79	-0.731	10.800	7.690	**6.40**	**4.56**	PS-AB-110621-09
				475.00							
				484.00	4.84	-0.686	8.050	5.700	4.71	3.34	PS-AB-110621-08
				490.00	4.88	-0.697	7.060	5.010	4.14	2.94	PS-AB-110621-07
				496.00	4.90	-0.625	6.640	4.750	3.83	2.74	PS-AB-110621-06
				506.30							
				512.00	4.70	-0.636	7.220	5.110	4.27	3.02	PS-AB-110621-05

Assessment of the offered antennas and body-worn accessory HLN6602A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories.

TABLE 27

Assessments at the Body (CW mode)											
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#
PMAE4068A (403-527 MHz)	PMNN4406A	HLN6602A	PMMN4024A RSM	406.125	4.85	-0.563	6.202	4.402	3.53	2.51	CcC-AB-110621-10
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4069A (403-450 MHz)	PMNN4406A	HLN6602A	PMMN4024A RSM	406.125	4.87	-0.598	6.734	4.767	3.86	2.74	CcC-AB-110621-11
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4406A	HLN6602A	PMMN4024A RSM	440.00							
				443.00							
				450.00	4.86	-0.465	9.450	6.701	5.26	3.73	CcC-AB-110621-13
				458.00	4.82	-0.608	9.683	6.901	5.57	3.97	CcC-AB-110621-12
				465.00	4.84	-0.769	8.265	5.942	4.93	3.55	CcC-AB-110621-14
				465.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4406A	HLN6602A	PMMN4024A RSM	470.00	4.80	-0.745	9.020	6.500	5.35	3.86	CcC-AB-110621-15
				475.00							
				484.00	4.85	-0.734	6.170	4.430	3.65	2.62	CcC-AB-110621-16
				490.00							
				496.00							
				506.30							
				512.00							

TABLE 27 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4409A	HLN6602A	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4069A (403-450 MHz)	PMNN4409A	HLN6602A	PMMN4024A RSM	406.125	4.84	-0.512	6.080	4.412	3.42	2.48	CcC-AB-110621-18
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4409A	HLN6602A	PMMN4024A RSM	440.00							
				443.00							
				450.00	4.81	-0.321	8.274	6.019	4.45	3.24	CcC-AB-110621-20
				458.00	4.75	-0.508	9.243	6.731	5.25	3.82	CcC-AB-110621-19
				465.00	4.78	-0.675	8.715	6.332	5.11	3.71	CcC-AB-110621-21
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4409A	HLN6602A	PMMN4024A RSM	470.00	4.77	-0.656	9.358	6.793	5.48	3.98	PS-AB-110622-02
				475.00							
				484.00	4.82	-0.696	6.830	4.950	4.01	2.91	PS-AB-110622-03
				490.00							
				496.00							
				506.30							
				512.00							

TABLE 27 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4412A	HLN6602A	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4069A (403-450 MHz)	PMNN4412A	HLN6602A	PMMN4024A RSM	406.125	4.71	-0.489	6.478	4.665	3.69	2.66	PS-AB-110622-05
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4412A	HLN6602A	PMMN4024A RSM	440.00							
				443.00							
				450.00	4.82	-0.378	9.319	6.751	5.08	3.68	PS-AB-110622-07
				458.00	4.78	-0.602	9.554	6.913	5.51	3.99	PS-AB-110622-06
				465.00	4.79	-0.687	8.846	6.422	5.19	3.77	PS-AB-110622-08
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4412A	HLN6602A	PMMN4024A RSM	470.00	4.74	-0.648	9.608	6.993	**5.65**	**4.11**	PS-AB-110622-09
				475.00							
				484.00	4.80	-0.810	7.110	5.180	4.28	3.12	PS-AB-110622-10
				490.00							
				496.00							
				506.30							
				512.00							

TABLE 27 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	NNTN8129A	HLN6602A	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4069A (403-450 MHz)	NNTN8129A	HLN6602A	PMMN4024A RSM	406.125	4.78	-0.526	6.070	4.382	3.44	2.48	CcC-AB-110622-12
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	NNTN8129A	HLN6602A	PMMN4024A RSM	440.00							
				443.00							
				450.00	4.78	-0.246	7.429	5.427	3.95	2.88	CcC-AB-110622-14
				458.00	4.72	-0.483	8.810	6.411	5.01	3.64	CcC-AB-110622-13
				465.00	4.73	-0.672	8.185	5.982	4.85	3.54	CcC-AB-110622-15
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	NNTN8129A	HLN6602A	PMMN4024A RSM	470.00	4.69	-0.646	8.777	6.403	5.21	3.80	CcC-AB-110622-16
				475.00							
				484.00	4.76	-0.733	6.360	4.640	3.80	2.77	CcC-AB-110622-17
				490.00							
				496.00							
				506.30							
				512.00							

13.8 Assessment at the Body with additional audio accessories:

Testing additional audio accessories per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Audio Accessories without Integral antenna.

TABLE 28

Assessments at the Body (CW mode)											
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#
PMAE4070A (440-490 MHz)	PMNN4407A	RLN4570A	PMMN5102A	440.00	4.84	-0.397	9.441	6.657	5.17	3.65	CcC-AB-110622-21
				443.00							
				450.00	4.84	-0.432	11.561	8.115	6.39	4.48	CcC-AB-110622-19
				458.00	4.80	-0.549	11.867	8.388	6.73	4.76	CcC-AB-110622-18
				465.00	4.85	-0.774	11.207	8.013	6.70	4.79	CcC-AB-110622-20
				470.00							
				475.00	4.82	-0.846	8.210	5.840	4.99	3.55	CcC-AB-110622-22
				484.00							
				490.00	4.90	-0.990	6.640	4.700	4.17	2.95	PS-AB-110623-02
			PMLN5096B	440.00	4.87	-0.423	9.381	6.577	5.17	3.62	PS-AB-110623-06
				443.00							
				450.00	4.88	-0.388	11.059	7.794	6.05	4.26	PS-AB-110623-04
				458.00	4.84	-0.650	11.204	7.842	6.51	4.55	PS-AB-110623-03
				465.00	4.86	-0.724	10.907	7.663	6.44	4.53	PS-AB-110623-05
				470.00							
				475.00	4.86	-0.664	8.270	5.860	4.82	3.41	PS-AB-110623-07
				484.00							
				490.00	4.89	-1.010	5.880	4.110	3.71	2.59	PS-AB-110623-10
			PMLN5275C	440.00	4.88	-0.415	9.977	7.090	5.49	3.90	CcC-AB-110623-14
				443.00							
				450.00	4.88	-0.427	11.561	8.235	6.38	4.54	CcC-AB-110623-12
				458.00	4.85	-0.492	12.204	8.722	6.83	4.88	CcC-AB-110623-11
				465.00	4.84	-0.770	11.207	7.953	6.69	4.75	CcC-AB-110623-13
				470.00							
				475.00	4.83	-0.922	8.670	6.160	5.36	3.81	CcC-AB-110623-15
				484.00							
				490.00	4.90	-1.330	6.670	4.700	4.53	3.19	CcC-AB-110623-16
			RLN5878A	440.00	4.89	-0.383	9.149	6.456	5.00	3.53	CcC-AB-110623-20
				443.00							
				450.00	4.91	-0.379	10.958	7.774	5.98	4.24	CcC-AB-110623-18
				458.00	4.86	-0.626	12.104	8.592	6.99	4.96	CcC-AB-110623-17
				465.00	4.87	-0.787	10.707	7.613	6.42	4.56	CcC-AB-110623-19
				470.00							
				475.00	4.87	-0.916	8.370	5.960	5.17	3.68	CcC-AB-110623-21
				484.00							
				490.00	4.92	-1.140	6.620	4.690	4.30	3.05	CcC-AB-110623-22
			RLN5880A	440.00	4.84	-0.398	9.674	6.798	5.30	3.73	PS-AB-110624-06
				443.00							
				450.00	4.88	-0.437	12.466	8.807	6.89	4.87	PS-AB-110624-04
				458.00	4.83	-0.623	12.204	8.662	7.04	5.00	PS-AB-110624-03
				465.00	4.83	-0.786	11.207	7.943	6.72	4.76	PS-AB-110624-05
				470.00							
				475.00	4.84	-0.878	8.690	6.180	5.32	3.78	PS-AB-110624-07
				484.00							
				490.00	4.89	-1.170	6.400	4.480	4.19	2.93	PS-AB-110624-08
			RLN5882A	440.00	4.85	-0.349	9.027	6.436	4.89	3.49	Lee-AB-110625-04
				443.00							
				450.00	4.88	-0.436	11.662	8.245	6.45	4.56	Lee-AB-110625-02
				458.00	4.82	-0.664	12.004	8.492	6.99	4.95	PS-AB-110624-10
				465.00	4.81	-0.722	9.436	6.772	5.57	4.00	Lee-AB-110625-03
				470.00							
				475.00	4.80	-0.709	7.750	5.570	4.56	3.28	Lee-AB-110625-05
				484.00							
				490.00	4.88	-1.110	5.620	3.980	3.63	2.57	Lee-AB-110625-06

TABLE 28 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4070A (440-490 MHz)	PMNN4407A	RLN4570A	PMLN5097A	440.00	4.83	-0.385	9.815	6.929	5.36	3.79	PS-AB-110626-03
				443.00							
				450.00	4.88	-0.342	10.556	7.573	5.71	4.10	Lee-AB-110625-09
				458.00	4.84	-0.580	11.404	8.202	6.52	4.69	Lee-AB-110625-08
				465.00	4.84	-0.936	10.206	7.143	6.33	4.43	PS-AB-110626-02
				470.00							
				475.00	4.84	-0.931	8.200	5.780	5.08	3.58	PS-AB-110626-04
				484.00							
				490.00	4.88	-1.190	6.260	4.400	4.12	2.89	PS-AB-110626-05
	PMNN4407A	RLN4570A	PMLN5111A	440.00	4.83	-0.407	9.401	6.657	5.16	3.66	PS-AB-110626-10
				443.00							
				450.00	4.90	-0.371	11.360	8.075	6.19	4.40	PS-AB-110626-08
				458.00	4.83	-0.600	12.604	8.922	**7.24**	**5.12**	PS-AB-110626-07
				465.00	4.86	-0.773	10.807	7.603	6.46	4.54	PS-AB-110626-09
				470.00							
				475.00	4.86	-0.809	8.600	6.100	5.18	3.67	CcC-AB-110627-02
				484.00							
				490.00	4.88	-1.220	6.530	4.580	4.32	3.03	CcC-AB-110627-03

13.9 Assessment of accessory PMLN5845A with carry strap NTN5243A:

Assessment of offered antennas and batteries with overall worst case audio cable configuration, body worn accessories PMLN5845A/ NTN5243A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to table 15 for highest output power channel.

TABLE 29

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30	4.95	-0.516	4.310	3.070	2.43	1.73	CcC-AB-110709-02
				512.00							

TABLE 29 (Continued)

Assessments at the Body (CW mode)											
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#**
PMAE4069A (403-450 MHz)	PMNN4407A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	406.125	4.85	-0.450	5.416	3.815	3.00	2.12	CcC-AB-110709-03
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4407A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00	4.80	-0.406	9.614	6.822	5.28	3.75	CcC-AB-110709-05
				465.00	4.82	-0.510	9.436	6.742	5.31	3.79	CcC-AB-110709-04
				470.00							
				475.00	4.80	-0.781	7.120	5.130	4.26	3.07	CcC-AB-110709-06
				484.00							
				490.00	4.88	-0.640	5.190	3.720	3.01	2.16	CcC-AB-110709-07
PMAE4071A (470-527 MHz)	PMNN4407A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	470.00	4.81	-0.634	9.328	6.733	**5.40**	**3.90**	CcC-AB-110709-10
				475.00							
				484.00							
				490.00	4.85	-0.650	6.380	4.590	3.71	2.67	CcC-AB-110709-09
				496.00							
				506.30							
				512.00	4.97	-0.482	7.080	5.100	3.96	2.85	CcC-AB-110709-08
PMAE4070A (440-490 MHz)	PMNN4406A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00							
				465.00	4.79	-0.594	7.465	5.432	4.29	3.12	PS-AB-110710-02
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4406A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	470.00	4.78	-0.681	7.620	5.510	4.48	3.24	PS-AB-110710-03
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4070A (440-490 MHz)	PMNN4409A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00							
				465.00	4.73	-0.442	7.835	5.712	4.40	3.21	PS-AB-110710-04
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4409A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	470.00	4.70	-0.602	8.140	5.880	4.77	3.45	PS-AB-110710-05
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							

TABLE 29 (Continued)

Assessments at the Body (CW mode)											
Antenna	Battery	Carry Accessory	Additional attachments	Test Freq. (MHz)	Initial Power (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#
PMAE4070A (440-490 MHz)	PMNN4412A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00							
				465.00	4.74	-0.601	8.465	6.042	4.92	3.51	PS-AB-110710-06
				470.00							
				475.00							
				484.00							
				490.00							
PMAE4071A (470-527 MHz)	PMNN4412A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	470.00	4.69	-0.643	8.660	6.200	5.14	3.68	PS-AB-110710-07
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00							
PMAE4070A (440-490 MHz)	NNTN8129A	NTN5243A w/ PMLN5845A (w/ fixed belt loop)	PMMN4024A RSM	440.00							
				443.00							
				450.00							
				458.00							
				465.00	4.70	-0.612	7.245	5.272	4.26	3.10	PS-AB-110710-08
				470.00	4.66	-0.746	7.630	5.510	4.67	3.37	PS-AB-110710-09
				475.00							
				484.00							
				490.00							

13.10 Assessments of wireless BT configurations:

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

TABLE 30

Assessments at the Body (CW mode)											
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#
PMAE4070A (440-490 MHz)	PMNN4407A	RLN4570A	None	440.00	4.86	-0.416	10.078	7.230	5.55	3.98	CcC-AB-110708-05
				443.00							
				450.00	4.85	-0.280	11.662	8.386	6.22	4.47	CcC-AB-110708-03
				458.00	4.84	-0.669	12.370	8.939	7.22	5.21	CcC-AB-110708-02
				465.00	4.80	-0.788	12.108	8.683	7.26	5.21	CcC-AB-110708-04
				470.00							
				475.00	4.83	-0.825	9.790	7.060	5.92	4.27	CcC-AB-110708-06
				484.00							
				490.00	4.88	-0.628	7.950	5.780	4.59	3.34	CcC-AB-110708-07
				465.00	4.83	-0.669	12.708	9.193	**7.41**	**5.36**	CcC-AB-110711-05

13.11 Assessments for Frequency range outside FCC Part 90:

Assessment using highest SAR configuration from Part 90 assessment above (Run# CcC-AB-110708-04; table 30) across the offered antennas (if applicable).

TABLE 31

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#
PMAE4068A (403-527 MHz)	PMNN4407A	RLN4570A	None	403.00	4.72	-0.396	9.051	6.476	**5.04**	**3.61**	CcC-AB-110708-08
				527.00	4.89	-1.240	4.670	3.420	3.11	2.28	CcC-AB-110708-10
PMAE4069A (403-450 MHz)				403.00	4.71	-0.167	8.877	6.314	4.70	3.34	CcC-AB-110708-11
PMAE4071A (470-527 MHz)				527.00	4.86	-0.925	7.910	5.800	4.89	3.59	CcC-AB-110708-12

13.12 Assessment at the Face - Radio power output:

The highest conducted power battery PMNN4407A was selected as the default battery. The conducted power measurement for all test channels within Part 90 frequency range (406.1-512 MHz) using battery PMNN4407A is listed in the table 32. The channel with highest conducted power was used as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01.

TABLE 32

Test Freq (MHz)	Power (W)
406.125	4.88
417.5	4.83
425.5	4.82
436	4.87
440	4.84
443	4.87
450	4.85
458	4.80
465	4.88
470	4.81
475	4.82
484	4.84
490	4.86
496	4.87
506.3	4.89
512	4.88

13.13 Assessment at the Face:

Assessment of each of the offered antennas with the default battery per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Head SAR Test Consideration. Refer to table 32 for highest power channel. Highest SAR results from each table are bolded. SAR plots of the highest results are presented in appendix E-G.

TABLE 33

Assessments at the Body (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	None	None	406.125							
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
				458.00							
				465.00							
				470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30	4.95	-0.557	3.343	2.482	1.90	1.41	CcC-FACE-110627-05
				512.00							
PMAE4069A (403-450 MHz)	PMNN4407A	None	None	406.125	4.89	-0.347	5.114	3.805	2.77	2.06	CcC-FACE-110627-06
				417.50							
				425.50							
				436.00							
				440.00							
				443.00							
				450.00							
PMAE4070A (440-490 MHz)	PMNN4407A	None	None	440.00							
				443.00							
				450.00							
				458.00	4.81	-0.346	6.551	4.878	3.55	2.64	CcC-FACE-110629-09
				465.00	4.84	-0.561	7.169	5.347	**4.08**	**3.04**	CcC-FACE-110629-10
				470.00							
				475.00	4.80	-0.775	5.865	4.369	3.51	2.61	PS-FACE-110629-11
				484.00							
				490.00	4.83	-0.660	4.390	3.270	2.56	1.90	PS-FACE-110629-12
PMAE4071A (470-527 MHz)	PMNN4407A	None	None	470.00							
				475.00							
				484.00							
				490.00							
				496.00							
				506.30							
				512.00	4.94	-0.629	4.920	3.670	2.84	2.12	PS-FACE-110629-17

Assessment of additional offered batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Head SAR Test Consideration.

TABLE 34

Assessments at the Face (CW mode)											
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#**
PMAE4070A (440-490 MHz)	PMNN4406A	None	None	465.00	4.81	-0.614	6.630	4.900	**3.82**	**2.82**	PS-FACE-110710-10
	PMNN4409A				4.77	-0.512	6.640	4.940	3.76	2.80	CcC-FACE-110711-02
	PMNN4412A				4.72	-0.494	6.500	4.820	3.70	2.75	CcC-FACE-110711-03
	NNTN8129A				4.72	-0.578	6.490	4.830	3.77	2.81	CcC-FACE-110711-04

13.14 Assessment of outside FCC Part 90 at the face:

Assessment using highest SAR configuration from Part 90 assessment above (Run# CcC-Face-110629-10) across the offered antennas (if applicable).

TABLE 35

Assessments at the Face (CW mode)											
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#**
PMAE4068A (403-527 MHz)	PMNN4407A	None	None	403.00	4.69	-0.427	4.540	3.379	2.56	1.91	CcC-FACE-110628-02
				527.00	4.86	-1.050	2.070	1.550	1.32	0.99	PS-FACE-110628-13
PMAE4069A (403-450 MHz)				403.00	4.69	-0.167	4.648	3.468	2.47	1.84	CcC-FACE-110629-02
PMAE4071A (470-527 MHz)				527.00	4.88	-1.080	4.120	3.080	**2.64**	**1.97**	PS-FACE-110629-18

13.15 Assessment of the BT band:

Assessment of the BT band at center frequency using the overall worst case configuration from both body and face assessments herein. The max calc SAR is added to the overall highest SAR result of the primary transmitter to obtain the simultaneous result in section 15.0.

TABLE 36

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#
0104039J80 (2402-2481 MHz)	PMNN4407A	RLN4570A	None	2441.00	0.008	-0.721	0.00709	0.00309	**0.00806**	**0.00351**	Lee-AB-110713-10

13.16 Shorten Scan Assessment

Short scan assessment: A "shortened" scan was performed to validate the SAR drift of the full DASY4™ coarse and 5x5x7 zoom scans. Note that the shortened scan represents the zoom scan performance result; this is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, a 5x5x7 zoom scan only was performed. The results of the shortened cube scan presented in APPENDIX E demonstrate that the scaling methodology used to determine the calculated SAR results presented herein are valid. Both SAR results from the table below are provided in APPENDIX E.

TABLE 37

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#
Shorten scan											
PMAE4070A (440-490 MHz)	PMNN4407A	RLN4570A	None	465.00	4.78	-0.348	14.109	10.204	**7.68**	**5.55**	CcC-AB-110711-06

14.0 Simultaneous Transmission Exclusion:

Simultaneous Transmission applies. See section 15.0.

15.0 Conclusion:

The highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for this filing: Models PMUE3681A :

Results for FCC Part 90 (406.125-512 MHz)

TABLE 38

Frequency Range (MHz)	Max Calc at Body (W/kg)		Simultaneous Tx	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
406.125-512	7.68	5.55	7.69	5.55

TABLE 39

Frequency Range (MHz)	Max Calc at Face (W/kg)		Simultaneous Tx	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
406.125-512	4.08	3.04	NA	NA

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8.0 W/kg** requirements of 47 CFR 2.1093(d).

Results for entire band (403-527 MHz)

TABLE 40

Frequency Range (MHz)	Max Calc at Body (W/kg)		Simultaneous Tx	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
403-527	7.68	5.55	7.69	5.55

TABLE 41

Frequency Range (MHz)	Max Calc at Face (W/kg)		Simultaneous Tx	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
403-527	4.08	3.04	NA	NA

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.

APPENDIX A
Measurement Uncertainty

The Measurement Uncertainty tables indicated in this APPENDIX are applicable to the DUT ranging from 100MHz to 800MHz, 800MHz to 3GHz and for Dipole test frequencies ranging from 300MHz to 800MHz and 800MHz to 3GHz. Therefore, the highest tolerance for the probe calibration uncertainty is indicated.

TABLE 1

Uncertainty Budget for Device Under Test, for 100 MHz to 800 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	IEEE 1528 section	**Tol. (± %)**	**Prob Dist**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	10.0	N	1.00	1	1	10.0	10.0	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				14	13	965
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				27	27	

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TABLE 2

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

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	IEEE 1528 section	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i (1 g)**	**c_i (10 g)**	**1 g u_i (±%)**	**10 g u_i (±%)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	9.0	N	1.00	1	1	9.0	9.0	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t. Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	∞
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	∞
Combined Standard Uncertainty			RSS				11	11	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				22	22	

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

Uncertainty Budget for Device Under Test, for 800 MHz to 3 GHz

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	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				11	11	411
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				22	22	

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Uncertainty Budget for System Validation (dipole & flat phantom) for 800 MHz to 3 GHz

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	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t. Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	∞
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	∞
Combined Standard Uncertainty			RSS				9	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				18	17	

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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 MY (Precision)**

Certificate No: ES3-3122_Apr11

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3122

Calibration procedure(s): QA CAL-01.v7, QA CAL-12.v6, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v3
Calibration procedure for dosimetric E-field probes

Calibration date: April 14, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41495277	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: April 14, 2011

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

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Swiss Calibration Service

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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	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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not 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* are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- *VR:* VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3122

Manufactured: July 11, 2006
Calibrated: April 14, 2011

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3122

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.36	1.24	1.44	± 10.1 %
DCP (mV)[B]	100.4	101.6	100.8	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	116.7	±1.9 %
			Y	0.00	0.00	1.00	113.1	
			Z	0.00	0.00	1.00	127.1	

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 5 and 6).
[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:3122

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	Depth (mm)	Unct. (k=2)
300	45.3	0.87	6.79	6.79	6.79	0.25	1.05	± 13.4 %
450	43.5	0.87	6.43	6.43	6.43	0.15	1.74	± 13.4 %
750	41.9	0.89	6.24	6.24	6.24	0.99	1.12	± 12.0 %
900	41.5	0.97	5.94	5.94	5.94	0.99	1.11	± 12.0 %
1810	40.0	1.40	5.07	5.07	5.07	0.86	1.20	± 12.0 %
2300	39.5	1.67	4.71	4.71	4.71	0.74	1.33	± 12.0 %
2450	39.2	1.80	4.41	4.41	4.41	0.73	1.34	± 12.0 %
2600	39.0	1.96	4.28	4.28	4.28	0.72	1.38	± 12.0 %
3500	37.9	2.91	4.07	4.07	4.07	0.85	1.30	± 13.1 %

[C] 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.
[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.

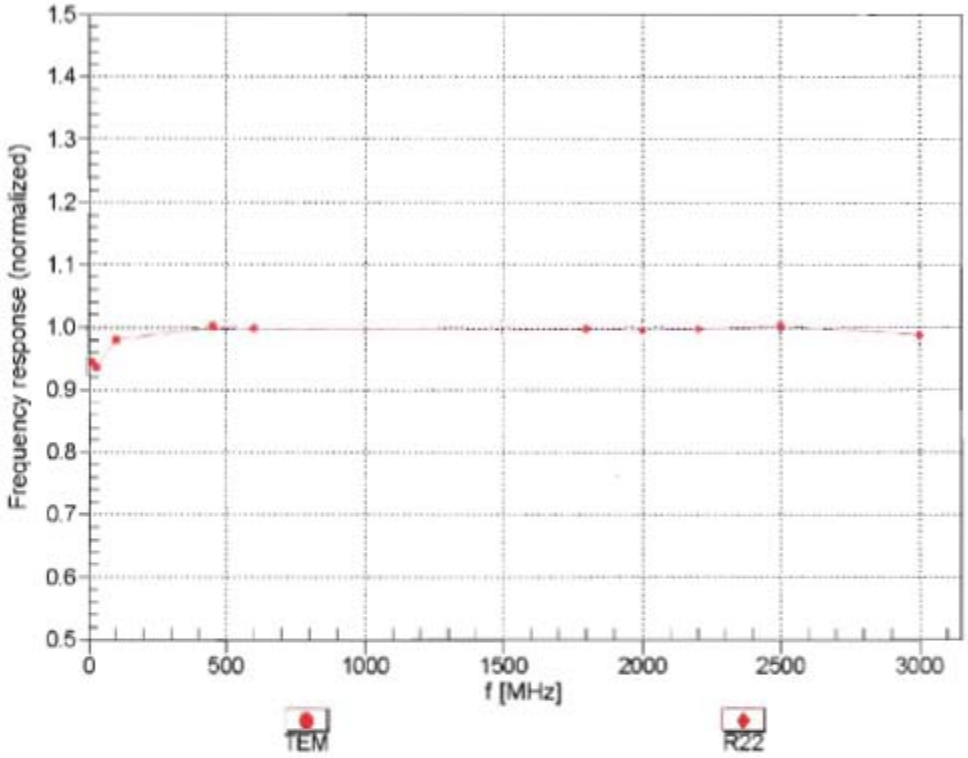
DASY/EASY - Parameters of Probe: ES3DV3- SN:3122

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	Depth (mm)	Unct. (k=2)
300	58.2	0.92	6.74	6.74	6.74	0.21	1.65	± 13.4 %
450	56.7	0.94	6.91	6.91	6.91	0.10	1.00	± 13.4 %
750	55.5	0.96	6.03	6.03	6.03	0.99	1.16	± 12.0 %
900	55.0	1.05	5.92	5.92	5.92	0.99	1.14	± 12.0 %
1810	53.3	1.52	4.80	4.80	4.80	0.86	1.23	± 12.0 %
2300	52.9	1.81	4.40	4.40	4.40	0.88	1.15	± 12.0 %
2450	52.7	1.95	4.15	4.15	4.15	0.98	1.03	± 12.0 %
2600	52.5	2.16	3.98	3.98	3.98	0.99	1.03	± 12.0 %
3500	51.3	3.31	3.46	3.46	3.46	0.85	1.37	± 13.1 %

[C] 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.
[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.

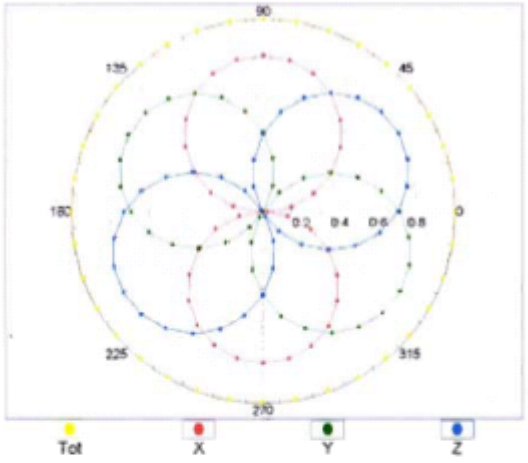
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



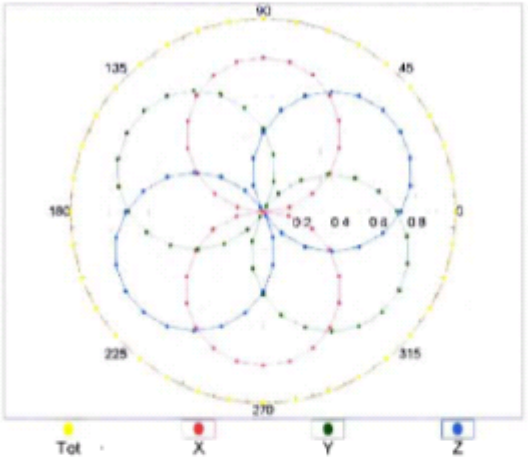
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

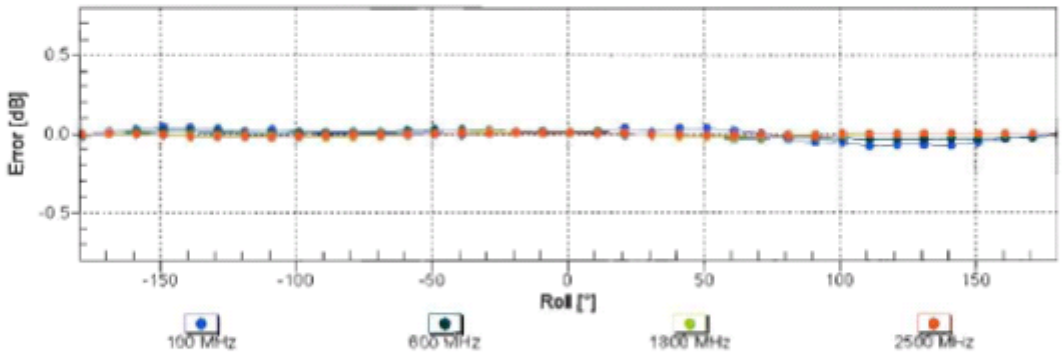
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



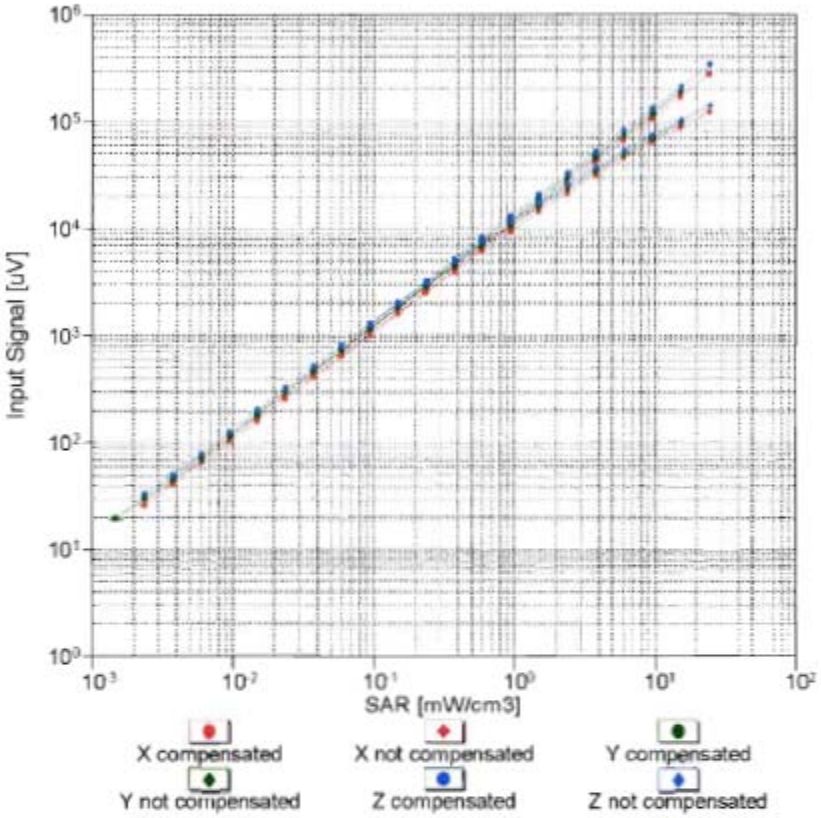
f=1800 MHz,R22

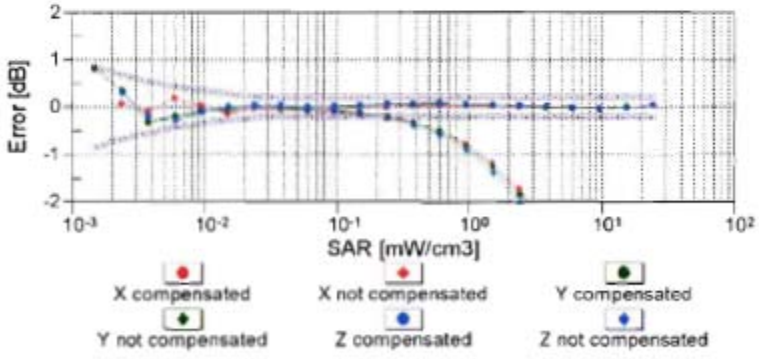




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

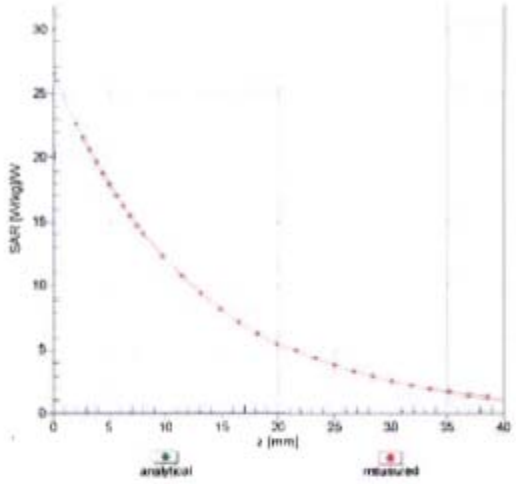




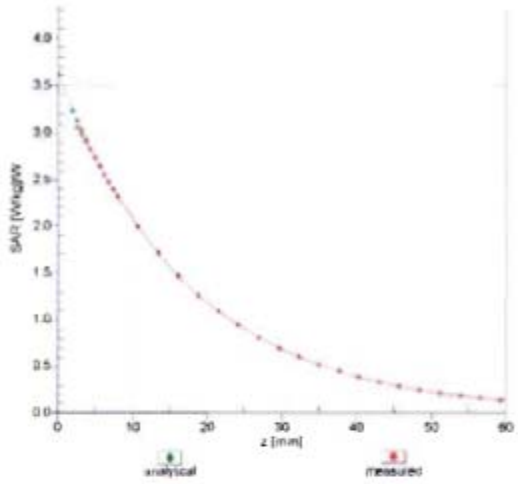
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 1810 MHz,WGLS R22 (H_convF)

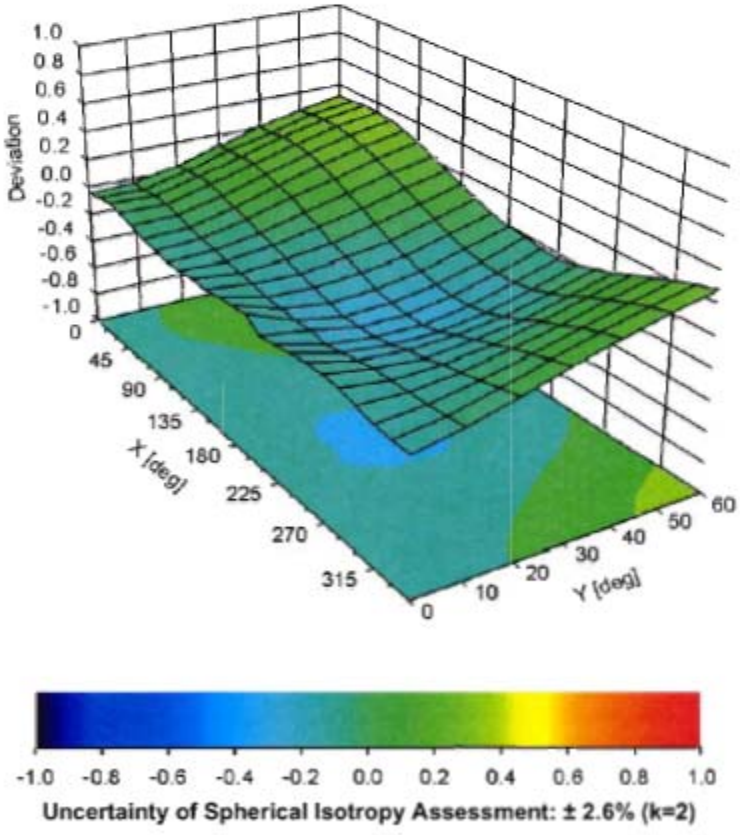


f = 900 MHz,WGLS R9 (H_convF)



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:3122

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
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

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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ES3DV3**
Serial Number:	**3122**
Place of Assessment:	**Zurich**
Date of Assessment:	**April 18, 2011**
Probe Calibration Date:	**April 14, 2011**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1810 MHz.

Assessed by:

Schmid & Partner Engineering AG

s p e a g

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Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Dosimetric E-Field Probe ES3DV3 SN:3122

Conversion factor (± standard deviation)

150 MHz	*ConvF*	**8.1 ± 10%**	ε_r = 52.3 σ = 0.76 mho/m (head tissue)
250 MHz	*ConvF*	**7.5 ± 10%**	ε_r = 47.6 σ = 0.83 mho/m (head tissue)
150 MHz	*ConvF*	**7.8 ± 10%**	ε_r = 61.9 σ = 0.80 mho/m (body tissue)
250 MHz	*ConvF*	**7.4 ± 10%**	ε_r = 59.4 σ = 0.88 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 C
Dipole Calibration Certificates

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Accreditation No.: SCS 108

Client Motorola MY (Precision)

Certificate No: D450V3-1053_Apr11

CALIBRATION CERTIFICATE

Object: D450V3 - SN: 1053

Calibration procedure(s): QA CAL-15.v5
Calibration Procedure for dipole validation kits below 800 MHz

Calibration date: April 18, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41495277	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.3 / 06327	29-Mar-11 (No. 217-01168)	Apr-12
Reference Probe ET3DV6	SN: 1507	30-Apr-10 (No. ET3-1507_Apr10)	Apr-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: April 19, 2011

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

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.

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Flat Phantom V4.4	Shell thickness: 6 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan Resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 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	45.3 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	398 mW input power	1.94 mW / g
SAR normalized	normalized to 1W	4.87 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**4.79 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	398 mW input power	1.29 mW / g
SAR normalized	normalized to 1W	3.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**3.18 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	60.3 Ω + 1.0 jΩ
Return Loss	- 20.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.350 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 16, 2005

DASY5 Validation Report for Head TSL

Date/Time: 18.04.2011 13:15:15

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1053

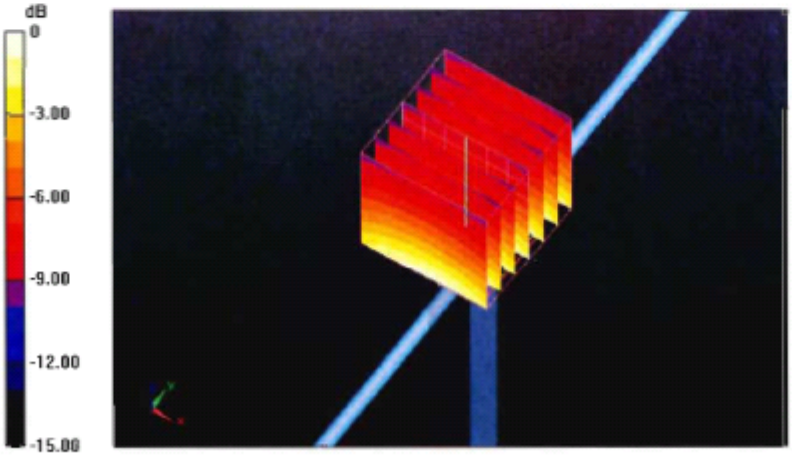
Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.9 mho/m; ε_r = 45.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.62, 6.62, 6.62); Calibrated: 30.04.2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 23.04.2010
- Phantom: Flat Phantom 4.4 ; Type: Flat Phantom 4.4; Serial: 1002
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

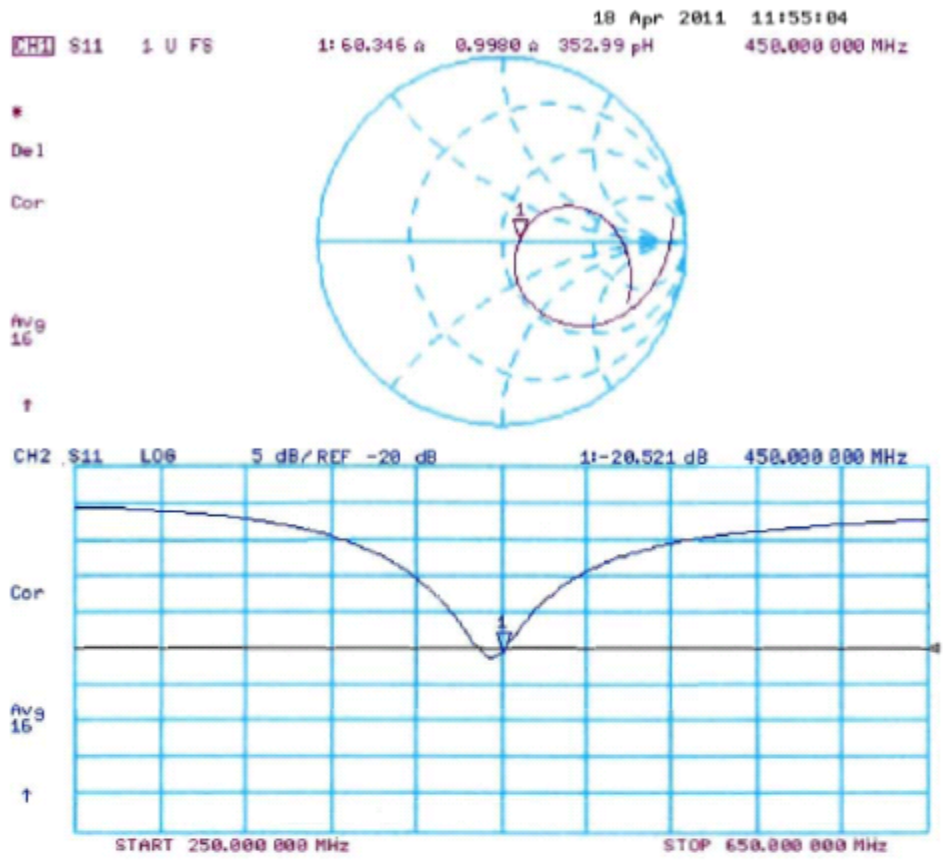
Pin=398mW /d=15mm /Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 49.716 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.997 W/kg
SAR(1 g) = 1.94 mW/g; SAR(10 g) = 1.29 mW/g
Maximum value of SAR (measured) = 2.073 mW/g



0 dB = 2.070mW/g

Impedance Measurement Plot for Head TSL



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Accreditation No.: SCS 108

Client Motorola MY (Precision)

Certificate No: D450V3-1054_Dec09

CALIBRATION CERTIFICATE

Object	D450V3 - SN: 1054
Calibration procedure(s)	QA CAL-15.v5 Calibration Procedure for dipole validation kits below 800 MHz
Calibration date:	December 15, 2009

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ET3DV6 (LF)	SN: 1507	03-Jul-09 (No. ET3-1507_Jul09)	Jul-10
DAE4	SN: 654	04-May-09 (No. DAE4-654_May09)	May-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

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

Issued: December 16, 2009

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Accreditation No.: SCS 108

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.

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan Resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 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	44.2 ± 6 %	0.86 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	398 mW input power	1.89 mW / g
SAR normalized	normalized to 1W	4.75 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**4.81 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	398 mW input power	1.26 mW / g
SAR normalized	normalized to 1W	3.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**3.20 mW /g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.5 Ω - 8.4 jΩ
Return Loss	- 20.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.357 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 16, 2005

DASY5 Validation Report for Head TSL

Date/Time: 15.12.2009 16:02:09

Test Laboratory: The name of your organization

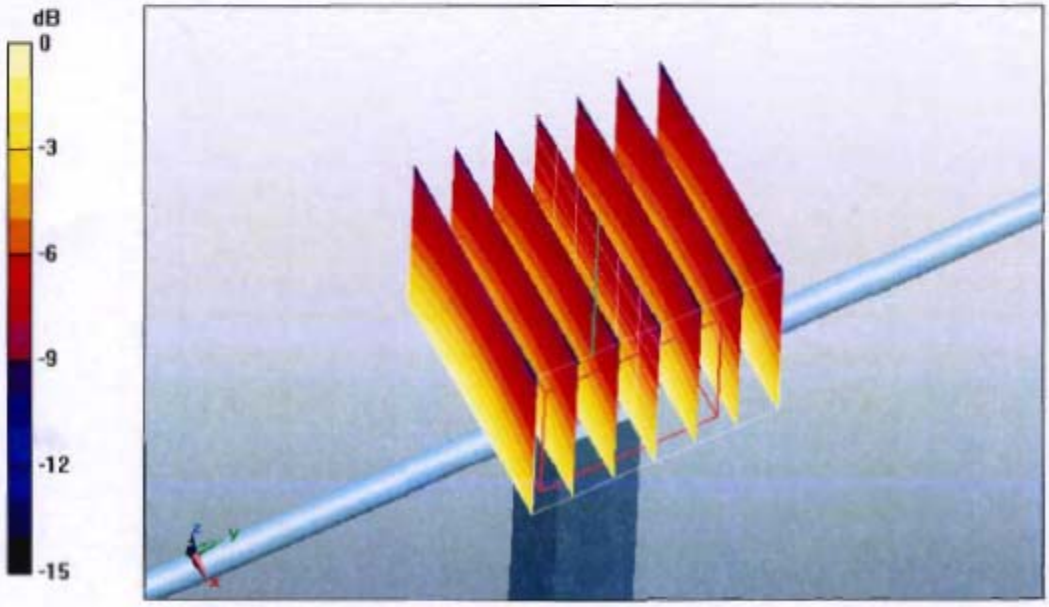
DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3- SN:1054

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.86 mho/m; ε_r = 44.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

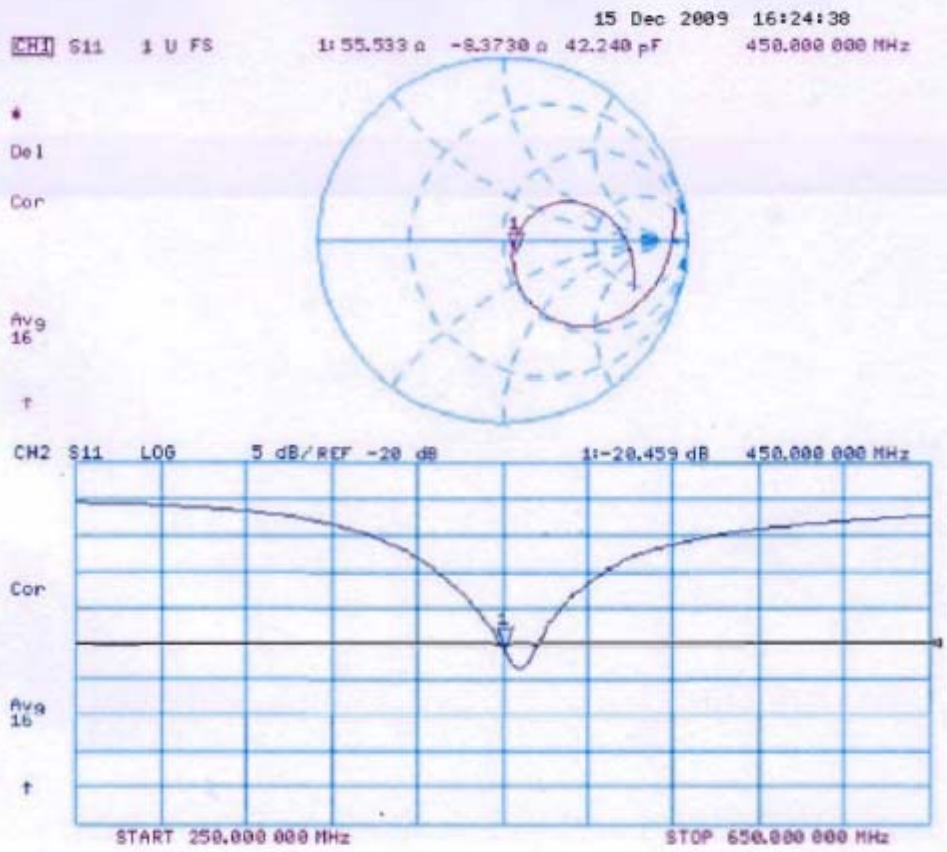
- Probe: ET3DV6 - SN1507 (LF); ConvF(6.66, 6.66, 6.66); Calibrated: 03.07.2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 04.05.2009
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 57

Pin=398mW /d=15mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.5 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 2.85 W/kg
SAR(1 g) = 1.89 mW/g; SAR(10 g) = 1.26 mW/g
Maximum value of SAR (measured) = 2.03 mW/g



0 dB = 2.03mW/g

Impedance Measurement Plot for Head TSL



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Accreditation No.: SCS 108

Client Motorola MY (Precision)

Certificate No: D2450V2-782_Dec09

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 782

Calibration procedure(s): QA CAL-05.v7
Calibration procedure for dipole validation kits

Calibration date: December 9, 2009

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	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 9, 2009

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Accreditation No.: SCS 108

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.

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.3 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature during test	(21.3 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 mW / g
SAR normalized	normalized to 1W	54.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**53.7 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.34 mW / g
SAR normalized	normalized to 1W	25.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 mW /g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω + 2.2 jΩ
Return Loss	- 29.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.156 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 6, 2005

DASY5 Validation Report for Head TSL

Date/Time: 09.12.2009 12:57:33

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:782

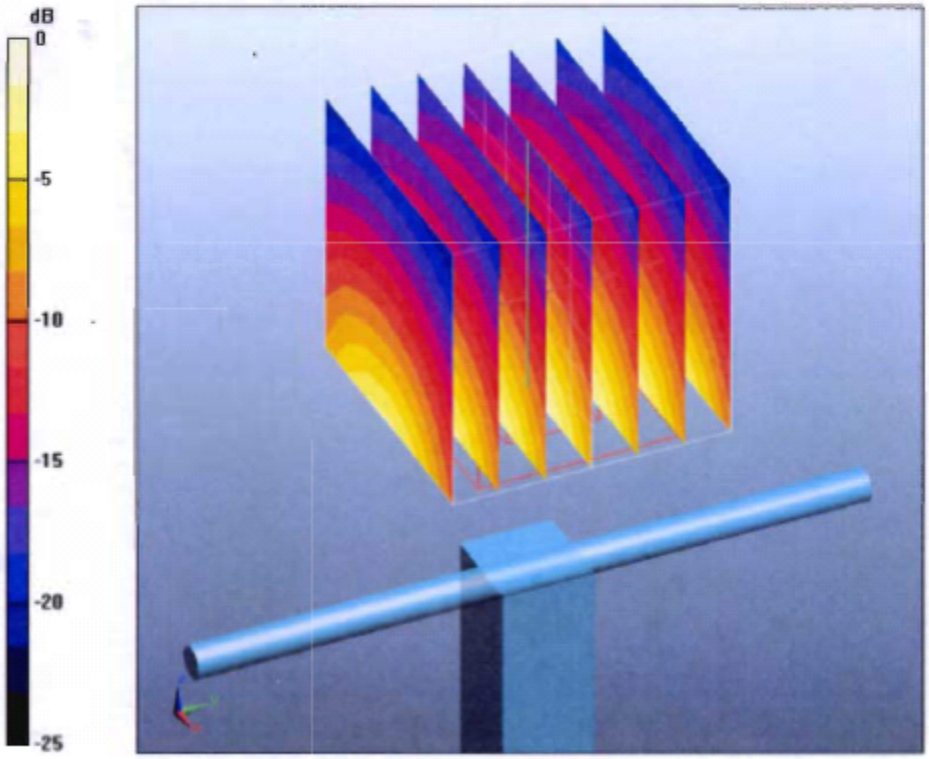
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Head/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.7 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.34 mW/g
Maximum value of SAR (measured) = 17.6 mW/g



0 dB = 17.6mW/g

Impedance Measurement Plot for Head TSL