

Appendix 4. Photographs

This appendix contains the following photographs:

Photo Reference Number	Title
PHT/80763JD01/001	Test configuration for the measurement of Specific Absorption Rate (SAR)
PHT/80763JD01/002	Touch Left
PHT/80763JD01/003	Tilt Left
PHT/80763JD01/004	Touch Right
PHT/80763JD01/005	Tilt Right
PHT/80763JD01/006	Front of EUT Facing Phantom
PHT/80763JD01/007	Rear of EUT Facing Phantom
PHT/80763JD01/008	Top of EUT Facing Phantom
PHT/80763JD01/009	Bottom of EUT Facing Phantom
PHT/80763JD01/010	LHS of EUT Facing Phantom
PHT/80763JD01/011	RHS of EUT Facing Phantom
PHT/80763JD01/012	General Setup With PHF
PHT/80763JD01/013	Front View of EUT
PHT/80763JD01/014	Rear View of EUT
PHT/80763JD01/015	Top View of EUT
PHT/80763JD01/016	Bottom View of EUT
PHT/80763JD01/017	LHS View of EUT
PHT/80763JD01/018	RHS View of EUT
PHT/80763JD01/019	Internal View of EUT
PHT/80763JD01/020	Battery View
PHT/80763JD01/021	PHF
PHT/80763JD01/022	900 MHz Head Fluid Level
PHT/80763JD01/023	900 MHz Body Fluid Level
PHT/80763JD01/024	1900 MHz Head Fluid Level
PHT/80763JD01/025	1900 MHz Body Fluid Level
PHT/80763JD01/026	2450 MHz Head Fluid Level
PHT/80763JD01/027	2450 MHz Body Fluid Level

PHT/80763JD01/001: Test configuration for the measurement of Specific Absorption Rate (SAR)



PHT/80763JD01/002: Touch Left



PHT/80763JD01/003: Tilt Left



PHT/80763JD01/004: Touch Right



PHT/80763JD01/005: Tilt Right



PHT/80763JD01/006: Front of EUT Facing Phantom



PHT/80763JD01/007: Rear of EUT Facing Phantom



PHT/80763JD01/008: Top of EUT Facing Phantom



PHT/80763JD01/009: Bottom of EUT Facing Phantom



PHT/80763JD01/010: LHS of EUT Facing Phantom



PHT/80763JD01/011: RHS of EUT Facing Phantom



PHT/80763JD01/012: General Setup With PHF



PHT/80763JD01/013: Front View of EUT



PHT/80763JD01/014: Rear View of EUT



PHT/80763JD01/015: Top View of EUT



PHT/80763JD01/016: Bottom View of EUT



PHT/80763JD01/017: LHS View of EUT



PHT/80763JD01/018: RHS View of EUT



PHT/80763JD01/019: Internal View of EUT



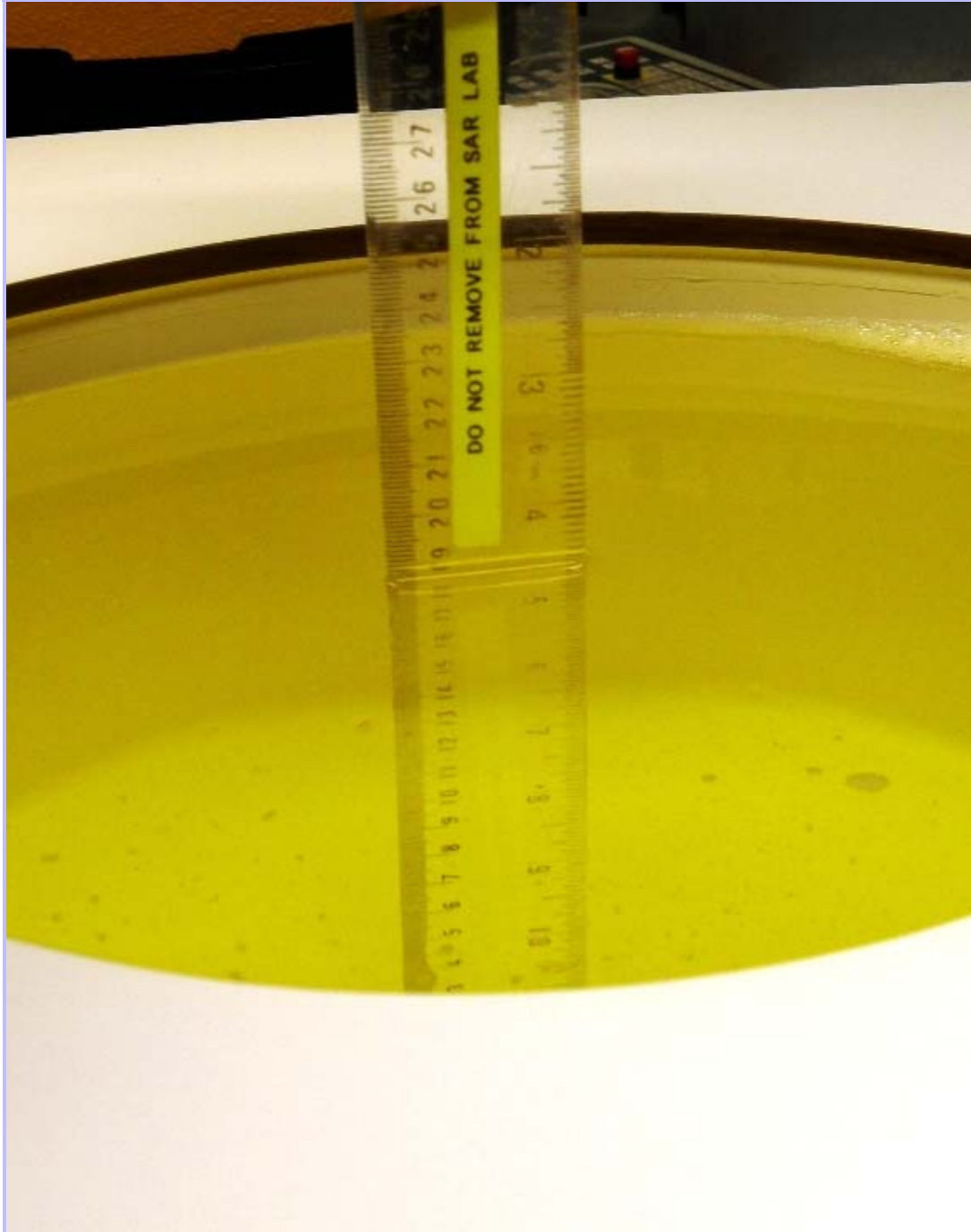
PHT/80763JD01/020: Battery View



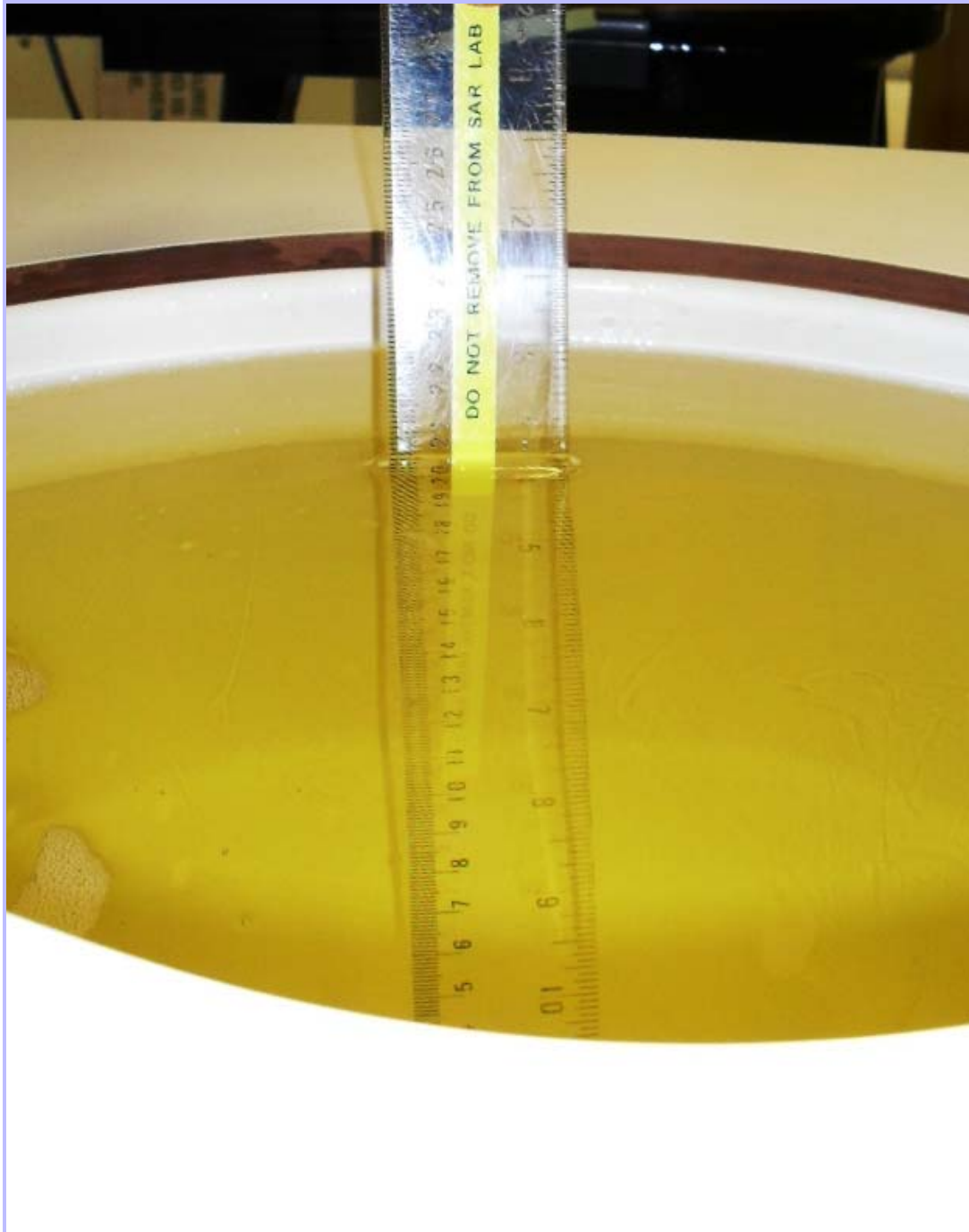
PHT/80763JD01/021: PHF



PHT/80763JD01/022: 900 MHz Head Fluid Level



PHT/80763JD01/023: 900 MHz Body Fluid Level



PHT/80763JD01/024: 1900 MHz Head Fluid Level



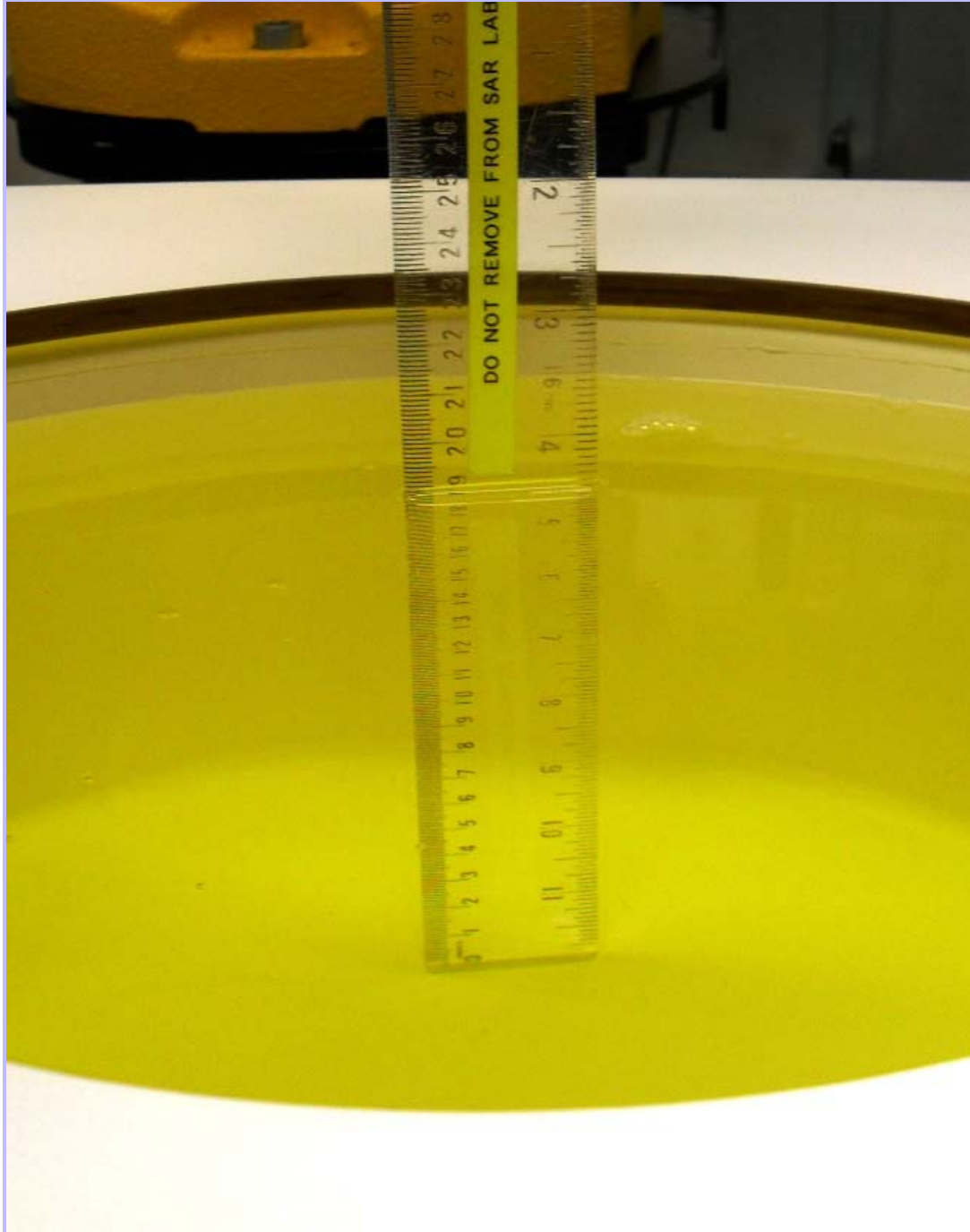
PHT/80763JD01/025: 1900 MHz Body Fluid Level



PHT/80763JD01/026: 2450 MHz Head Fluid Level



PHT/80763JD01/027: 2450 MHz Body Fluid Level



Appendix 5. Validation of System

Prior to the assessment, the system was verified in the flat region of the phantom. 900 MHz, 1800 MHz, 1900 MHz and 2450 MHz dipoles were used. A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of $\pm 5\%$ for the 900 MHz, 1800 MHz, 1900 MHz and 2450 MHz dipole. The applicable verification (normalised to 1 Watt).

Date: 06/02/20

Validation Dipole and Serial Number: D900V2 SN:185

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0 °C	22.5 °C	ϵ_r	41.50	41.58	0.19	5.00
				σ	0.97	0.95	-2.24	5.00
				1g SAR	11.00	10.96	-0.36	5.00
				10g SAR	7.06	7.12	0.85	5.00

Date: 07/02/2011

Validation Dipole and Serial Number: D900V2 SN:185

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0 °C	22.5 °C	ϵ_r	41.50	41.58	0.19	5.00
				σ	0.97	0.95	-2.24	5.00
				1g SAR	11.00	11.08	0.73	5.00
				10g SAR	7.06	7.20	1.98	5.00

Note: As testing was performed on both head and body in this frequency range, only head validation was performed to cover both test configuration. Below is the measured dielectric values used for body test which was performed within 24 hours of the test.

Date: 07/02/20

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0 °C	23.2 °C	ϵ_r	55.00	52.29	4.98	5.00
				σ	1.05	1.03	-1.63	5.00

Date: 08/02/2011

Validation Dipole and Serial Number: D900V2 SN:185

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0 °C	23.2 °C	ϵ_r	55.00	52.29	-4.93	5.00
				σ	1.05	1.03	-1.63	5.00
				1g SAR	11.00	10.64	-3.27	5.00
				10g SAR	7.16	6.88	-3.91	5.00

Date: 11/02/2011**Validation Dipole and Serial Number: D900V2 SN:185**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0 °C	23.0 °C	ϵ_r	55.00	52.80	-4.00	5.00
				σ	1.05	1.02	-2.71	5.00
				1g SAR	11.00	11.32	2.91	5.00
				10g SAR	7.16	7.36	2.79	5.00

Note: As testing was performed on both head and body in this frequency range, only Body validation was performed to cover both test configuration. Below is the measured dielectric values used for head test which was performed within 24 hours of the test.

Date:11/02/2011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0 °C	23.0 °C	ϵ_r	41.50	41.86	0.87	5.00
				σ	0.97	0.97	-3.58	5.00

Date:17/02/2011**Validation Dipole and Serial Number:D900V2 SN:185**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0 °C	22.9 °C	ϵ_r	41.50	41.82	0.77	5.00
				σ	0.97	0.94	-3.10	5.00
				1g SAR	11.00	10.96	-0.36	5.00
				10g SAR	7.06	7.16	1.42	5.00

Note: As testing was performed on both head and body in this frequency range, only head validation was performed to cover both test configuration. Below is the measured dielectric values used for body test which was performed within 24 hours of the test.

Date: 17/02/2011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0 °C	22.9 °C	ϵ_r	55.00	52.80	-4.00	5.00
				σ	1.05	1.02	-2.71	5.00

Date: 09/02/2011

Validation Dipole and Serial Number: D1900V2:SN:537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	°C	°C	ϵ_r	40.00	38.73	-3.18	5.00
				σ	1.40	1.44	2.96	5.00
				1g SAR	40.20	38.48	-4.28	5.00
				10g SAR	20.70	19.92	-3.72	5.00

Note: As testing was performed on both head and body in this frequency range, only head validation was performed to cover both test configuration. Below is the measured dielectric values used for body test which was performed within 24 hours of the test.

Date: 09/02/2011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	23.0 °C	ϵ_r	53.30	50.94	-4.43	5.00
				σ	1.52	1.58	3.62	5.00

Date: 14/02/2011

Validation Dipole and Serial Number: D1900V2:SN:537

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	23.0 °C	22.6 °C	ϵ_r	40.00	39.92	-0.20	5.00
				σ	1.40	1.41	0.83	5.00
				1g SAR	40.20	39.40	-1.89	5.00
				10g SAR	20.70	20.52	-0.87	5.00

Note: As testing was performed on both head and body in this frequency range, only head validation was performed to cover both test configuration. Below is the measured dielectric values used for body test which was performed within 24 hours of the test.

Date: 14/02/2011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	22.6 °C	ϵ_r	53.30	51.32	-3.71	5.00
				σ	1.52	1.58	3.89	5.00

Date: 15/02/2011**Validation Dipole and Serial Number: D1900V2:SN:537**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	23.0 °C	22.6 °C	ϵ_r	40.00	39.92	-0.20	5.00
				σ	1.40	1.41	0.83	5.00
				1g SAR	40.20	42.00	4.48	5.00
				10g SAR	20.70	21.72	4.93	5.00

Note: As testing was performed on both head and body in this frequency range, only head validation was performed to cover both test configuration. Below is the measured dielectric values used for body test which was performed within 24 hours of the test.

Date: 15/02/2011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	23.0 °C	ϵ_r	53.30	51.32	-3.71	5.00
				σ	1.52	1.58	3.89	5.00

Date: 16/02/2011**Validation Dipole and Serial Number: D1900V2:SN:537**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	°C	°C	ϵ_r	40.00	39.68	-0.80	5.00
				σ	1.40	1.38	-1.54	5.00
				1g SAR	40.20	40.80	1.49	5.00
				10g SAR	20.70	21.28	2.80	5.00

Note: As testing was performed on both head and body in this frequency range, only head validation was performed to cover both test configuration. Below is the measured dielectric values used for body test which was performed within 24 hours of the test.

Date: 16/02/2011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	23.0 °C	ϵ_r	53.30	50.79	-4.71	5.00
				σ	1.52	1.50	-1.10	5.00

Date: 10/02/2011

Validation Dipole and Serial Number: D2450V2:SN:725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	°C	°C	ϵ_r	52.70	51.11	-3.02	5.00
				σ	1.95	2.02	3.43	5.00
				1g SAR	51.90	53.60	3.28	5.00
				10g SAR	24.10	24.32	0.91	5.00

Date: 11/02/2011

Validation Dipole and Serial Number: D2450V2:SN:702

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	24.0 °C	23.2 °C	ϵ_r	52.70	51.11	-3.02	5.00
				σ	1.95	2.02	3.43	5.00
				1g SAR	54.30	53.60	-1.29	5.00
				10g SAR	25.50	24.32	-4.63	5.00

Note: As testing was performed on both head and body in this frequency range, only body validation was performed to cover both test configuration. Below is the measured dielectric values used for head test which was performed within 24 hours of the test.

Date: 11/02/2011

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	°C	°C	ϵ_r	39.20	38.58	-1.58	5.00
				σ	1.80	1.80	0.00	5.00

Appendix 6. Simulated Tissues

The body mixture consists of water and glycol. Visual inspection is made to ensure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.

Ingredient	Frequency
	835/850/900 MHz Head
De-Ionized Water	52.87
Polysorbate 20 (Tween 20)	46.10
Salt	1.03

Ingredient	Frequency
	835/850/900 MHz Body
De-Ionized Water	71.30
Polysorbate 20 (Tween 20)	28.00
Salt	0.70

Ingredient	Frequency
	1800/1900 MHz Head
De-Ionized Water	55.40
Polysorbate 20 (Tween 20)	44.22
Salt	0.38

Ingredient	Frequency
	1800/1900 MHz Body
De-Ionized Water	71.50
Polysorbate 20 (Tween 20)	28.00
Salt	0.50

Ingredient	Frequency
	2450 MHz Head
De-Ionized Water	55.75
Polysorbate 20 (Tween 20)	45.25

Ingredient	Frequency
	2450 MHz Body
De-Ionized Water	71.70
Polysorbate 20 (Tween 20)	28.00
Salt	0.30

Appendix 7. DASY4 System Details

A.7.1. DASY4 SAR Measurement System

RFI Global Services Ltd, SAR measurement facility utilises the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, and the SAM phantom containing brain or muscle equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller; teach pendant (Joystick), and remote control. This is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. The data acquisition electronics (DAE) performs signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection etc. The DAE is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE3 utilises a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

A.7.2. DASY4 SAR System Specifications

Robot System

Positioner:	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability:	0.025 mm
No. of Axis:	6
Serial Number:	F00/SD89A1/A/01
Reach:	1185 mm
Payload:	3.5 kg
Control Unit:	CS7
Programming Language:	V+

Data Acquisition Electronic (DAE) System

Serial Number:	DAE3 SN:394
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PC Controller

PC:	Dell Precision 340
Operating System:	Windows 2000
Data Card:	DASY4 Measurement Server
Serial Number:	1080

Data Converter

Features:	Signal Amplifier, multiplexer, A/D converted and control logic.
Software:	DASY4 Software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock.

PC Interface Card

Function:	24 bit (64 MHz) DSP for real time processing Link to DAE3 16 bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.
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DASY4 SAR System Specifications (Continued)**E-Field Probe**

Model:	ETSDV6
Serial No:	1583
Construction:	Triangular core
Frequency:	10 MHz to >6 GHz
Linearity:	± 0.2 dB (30 MHz to 6 GHz)
Probe Length (mm):	330
Probe Diameter (mm):	12
Tip Length (mm):	20
Tip Diameter (mm):	2.5
Sensor X Offset (mm):	1
Sensor Y Offset (mm):	1
Sensor Z Offset (mm):	1

Phantom

Phantom:	SAM Phantom
Shell Material:	Fibreglass
Thickness:	2.0 \pm 0.1 mm