Appendix 5. Validation of System

Prior to the assessment, the system was verified in the flat region of the phantom.
900MHz, 1800 MHz, 1900MHz and 2450 MHz dipole were used. A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±5% for the 900MHz, 1800MHz, 1900MHz and 2450 MHz dipoles.

The applicable verification normalised to 1 Watt.

900 Head Validation:

Date: 05/01/2012
Validation Dipole and Serial Number: D900V2; SN: 124

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0ºC	22.8ºC	ε_r	41.50	41.96	1.12	5.00
				σ	0.97	0.93	-4.47	5.00
				1g SAR	11.00	10.88	-1.09	5.00
				10g SAR	7.01	7.12	1.57	5.00

900 Body Validations:

Date: 09/01/2012
Validation Dipole and Serial Number: D900V2; SN: 124

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	22.0ºC	22.2ºC	ε_r	55.00	52.51	-4.52	5.00
				σ	1.05	1.04	-0.75	5.00
				1g SAR	11.10	10.60	-4.50	5.00
				10g SAR	7.14	6.92	-3.08	5.00

Date: 10/01/2012
Validation Dipole and Serial Number: D900V2; SN: 124

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	22.0ºC	22.2ºC	ε_r	55.00	52.51	-4.52	5.00
				σ	1.05	1.04	-0.75	5.00
				1g SAR	11.10	11.04	-0.54	5.00
				10g SAR	7.14	7.16	0.28	5.00

1900 Head Validation:

Date: 11/01/2012
Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	23.0ºC	22.1ºC	ε_r	40.00	38.31	-4.22	5.00
				σ	1.40	1.46	4.22	5.00
				1g SAR	40.30	40.80	1.24	5.00
				10g SAR	21.00	21.08	0.38	5.00

1900 Body Validation:

Date: 12/01/2012
Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0ºC	23.7ºC	ε_r	53.30	51.53	-3.33	5.00
				σ	1.52	1.59	4.38	5.00
				1g SAR	40.70	41.20	1.23	5.00
				10g SAR	21.60	21.72	0.56	5.00

Date: 13/01/2012
Validation Dipole and Serial Number: D1900V2; SN: 540

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	24.0ºC	23.7ºC	ε_r	53.30	51.53	-3.33	5.00
				σ	1.52	1.59	4.38	5.00
				1g SAR	40.70	40.80	0.25	5.00
				10g SAR	21.60	21.32	-1.30	5.00

2450 Head Validation:

Date: 17/01/2012
Validation Dipole and Serial Number: D2450V2; SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	2450	24.0 ºC	23.0 ºC	ε_r	39.20	38.36	-2.15	5.00
				σ	1.80	1.82	0.96	5.00
				1g SAR	52.90	51.20	-3.21	5.00
				10g SAR	24.70	23.60	-4.45	5.00

2450 Body Validation:

Date: 17/01/2012
Validation Dipole and Serial Number: D2450V2; SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0 ºC	22.3 ºC	ε_r	52.70	50.60	-3.99	5.00
				σ	1.95	2.02	3.82	5.00
				1g SAR	51.90	53.60	3.28	5.00
				10g SAR	24.10	24.40	1.24	5.00

Date: 18/01/2012
Validation Dipole and Serial Number: D2450V2; SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0 ºC	22.3 ºC	ε_r	52.70	50.60	-3.99	5.00
				σ	1.95	2.02	3.82	5.00
				1g SAR	51.90	53.20	2.50	5.00
				10g SAR	24.10	24.32	0.91	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 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

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

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 mulitplexer, 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:450
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 nit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.

DASY4 SAR System Specifications (Continued)	
E-Field Probe	
Model:	EX3DV3
Serial No:	3814
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
E-Field Probe	
Model:	ET3DV6
Serial No:	1528
Construction:	Triangular core
Frequency:	735 MHz to >3.00 GHz
Linearity:	±0.2 dB (735 MHz to 3.00 GHz)
Probe Length (mm):	337
Probe Diameter (mm):	10
Tip Length (mm):	10
Tip Diameter (mm):	6.8
Sensor X Offset (mm):	2.7
Sensor Y Offset (mm):	2.7
Sensor Z Offset (mm):	2.7
Phantom	
Phantom:	SAM Phantom
Shell Material:	Fibreglass
Thickness:	2.0 ±0.1 mm