APPENDIX 3 : Test instruments

1. Equipment used

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MURC-02	WirelessCommunication Test Set	Agilent	E5515C	GB47050683	Power measurement SAR	2009/10/20 * 36
MCC-116	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	290221/4	Power measurement	2010/08/05 * 12
MAT-20	Attenuator(10dB)(above1 GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	Power measurement	2011/01/06 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	Power measurement	2011/03/14 * 12
MPD-01	PowerDivider DC to 26.5GHz	Agilent	11636B	52258	Power measurement	2011/03/17 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	Power measurement	2010/09/10 * 12
MPSE-11	Power seter	Anritsu	MA2441B	011737	Power measurement	2010/09/10 * 12
MPM-01	Power Meter	Agilent	E4417A	GB41290639	SAR	2011/02/01 * 12
MPSE-01	Power Sensor	Agilent	E9300B	US40010300	SAR	2011/01/28 * 12
MPSE-03	Power sensor	Agilent	E9327A	US40440576	SAR	2011/02/02 * 12
MAT-15	Attenuator(30dB)	Agilent	8498A	US40010300	SAR	2011/02/16 * 12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2010/09/08 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	SAR	2011/03/10 * 12
MHDC-11	Dual Directional Coupler	Hewlett Packard	778D	16605	SAR	Pre Check
MNA-01	Network Analyzer	Agilent/HP	E8358A	US41080381	SAR	2010/08/19 * 12
MDPK-01	Dielectric probe kit	Agilent	85070D	702	SAR	2010/10/25 * 12
MNCK-01	Type N Calibration Kit	Agilent	85032F	MY41495257	SAR	2010/08/10 * 12
MPB-03	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV3	3507	SAR	2011/03/16 * 12
MDAE-01	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3 V1	509	SAR	2010/07/07 * 12
MPF-02	2mmOval Flat Phantom ERI 4.0	Schmid&Partner Engineering AG	QD VA 001B (ERI4.0)	1045	SAR	Pre Check
COTS-MSAR-02	DASY5	Schmid&Partner Engineering AG	DASY52 V52.6	-	SAR	-
COTS-MSAR-02	S-Parameter Network Analyzer	Agilent	-	-	SAR	-
MDA-05	Dipole Antenna	Schmid&Partner Engineering AG	D900V2	155	SAR	2010/12/06 * 24
MDA-06	Dipole Antenna	Schmid&Partner Engineering AG	D1800V2	2d040	SAR	2010/12/09 * 24
MDA-07	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	713	SAR	2010/09/06 * 36
MOS-05	Thermo-Hygrometer	Custom	CTH-190	810201	SAR	2010/04/21 * 12
MOS-10	Digtal thermometer	HANNA	Checktemp-2	MOS-10	SAR	2010/08/02 * 12
MBM-13	Barometer	Sunoh	SBR121	837	SAR	2011/03/14 * 36
MSL900					Daily check Target value ± 5%	
MSL1800					Daily check Target value ± 5%	
MSL2450					Daily check Target value ± 5%	
SAR room					Daily check Ambient Noise<0.012W/kg	

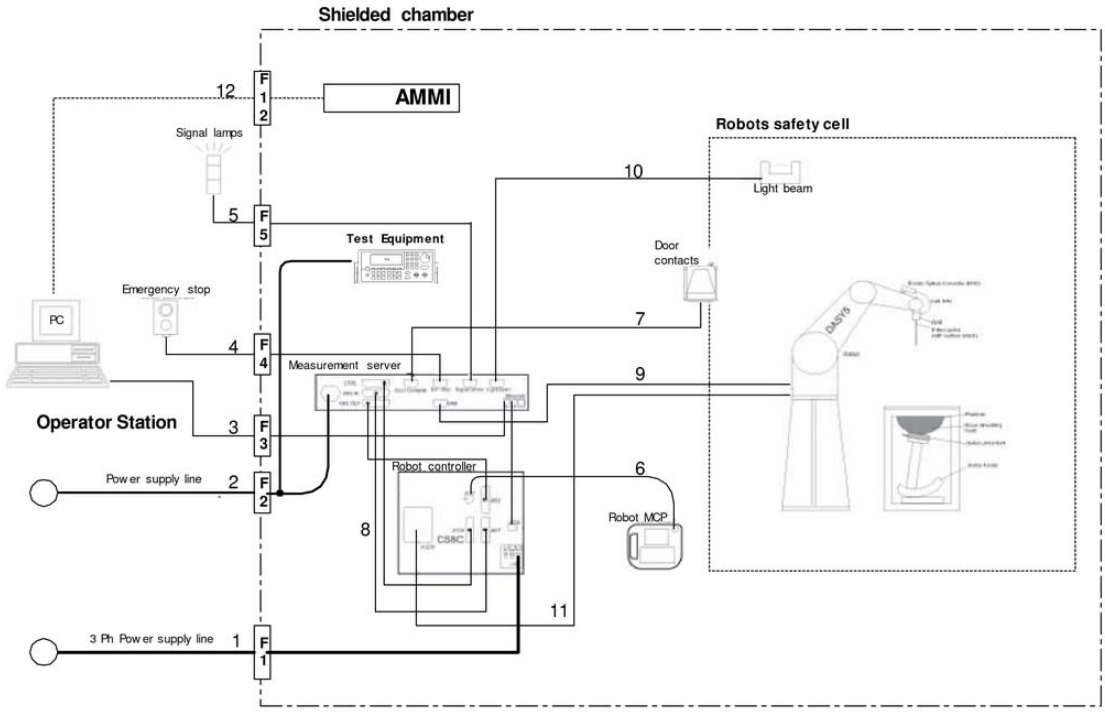
The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibration

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

2. Dosimetry assessment setup

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than +/- 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetry probe EX3DV3, SN: 3507 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [2] with accuracy of better than +/-10%. The spherical isotropy was evaluated with the procedure described in [3] and found to be better than +/-0.25 dB. The phantom used was the
SAM Twin Phantom as described in FCC supplement C, IEEE P1528 and CENELEC EN50361.

3. Configuration and peripherals



The DASY5 system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
   An arm extension for accommodating the data acquisition electronics (DAE).

2. An isotropic field probe optimized and calibrated for the targeted measurement.

3. A data acquisition electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.

5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

6. The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.

7. A computer running WinXP and the DASY5 software.

8. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

9. The phantom, the device holder and other accessories according to the targeted measurement.

4. System components

EX3DV3 Probe Specification

Construction:
Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)

Calibration(S/N 3507):
Basic Broad Band Calibration in air : 10-3000 MHz
Conversion Factors(Head and Body): 450MHz,900 MHz,1810MHz,2000MHz,2450MHz
5.2GHz,5.3GHz,5.5GHz,5.6GHz,5.8GHz

Frequency:
10 MHz to > 6GHz; Linearity: +/-0.2 dB(30 MHz to 3 GHz)

Directivity:
+/-0.3 dB in HSL (rotation around probe axis)
+/-0.5 dB in tissue material (rotation normal probe axis)

Dynamic Range:
10uW/g to > 100 mW/g;Linearity: +/-0.2 dB(noise: typically < 1uW/g)

Dimensions:
Overall length: 330 mm (Tip: 20 mm)
Tip diameter: 2.5mm (Body: 12 mm)
Typical distance from probe tip to dipole centers: 1 mm

Application:
Highprecision dosimetric measurement in any exposure scenario
(e.g., very strong gradient fields).Only probe which enables compliance
testing for frequencies up to 6GHz with precision of better 30%.

EX3DV3 E-field Probe

2mm Flat phantom ERI4.0

Description
Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles.

Shell Thickness
2.0 ± 0.2 mm (sagging: <1%)

Filling Volume
approx. 30 liters

Dimensions
Major ellipse axis: 600 mm
Minor axis: 400 mm

Compatibilities
- Standard: IEC 62209 Part II (Draft 0.9 and higher)
- Software release: DASY 4.5 or higher
- SPEAG standard phantom table
- all SPEAG dosimetric probes and dipoles

Device Holder
For this measurement, the urethane foam was used as device holder.

5. Test system specifications

Robot TX60L

Number of Axes	:	6
Nominal Load	:	2 kg
Maximum Load	:	5kg
Reach	:	920mm
Repeatability	:	+/-0.03mm
Control Unit	:	CS8c
Programming Language	:	VAL3
Weight	:	52.2kg
Manuafacture	:	Stäubli Unimation Corp. Robot Model: TX60L

DASY5 Measurement server

Features	:	Intel ULV Celeron 400MHz 128MB chip disk and 128MB RAM 16 Bit A/D converter for surface detection system Vacuum Fluorescent Display Robot Interface Serial link to DAE (with watchdog supervision) Door contact port (Possibility to connect a light curtain) Emergency stop port (to connect the remote control) Signal lamps port Light beam port Three Ethernet connection ports Two USB 2.0 Ports Two serial links Expansion port for future applications
Dimensions	:	(L x W x H): 440 x 241 x 89 mm
Manufacture	:	Schimid & Partner Engineering AG

Data Acquisition Electronic (DAE)

Features	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY5 embedded system (fully remote controlled) 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version)
Measurement Range	:	1 µV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 1 µV (with auto zero)
Input Resistance	:	200 MΩ
Battery Power	:	> 10 h of operation (with two 9 V battery)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schimid & Partner Engineering AG

Software

Item	:	Dosimetric Assesment System DASY5
Type No.	:	SD 000 401A, SD 000 402A
Software version No.	:	DASY52, Version 52.6 (1)
Manufacture / Origin	:	Schimid & Partner Engineering AG

E-Field Probe

Model	:	EX3DV3
Serial No.	:	3507
Construction	:	Symmetrical design with triangular core
Frequency	:	10 MHz to 6 GHz
Linearity	:	+/-0.2 dB (30 MHz to 3 GHz)
Manufacture	:	Schimid & Partner Engineering AG

Phantom

Type	:	2mm Flat phantom ERI4.0
Shell Thickness	:	2.0 ± 0.2 mm (sagging: <1%)
Filling Volume	:	approx. 30 liters
Dimensions	:	Major ellipse axis: 600 mm Minor axis: 400 mm
Manufacture	:	Schimid & Partner Engineering AG

6. 900MHz Simulated Tissues Composition

Ingredient	MiXTURE(%)	
	Head 900MHz	Muscle 900MHz
Water	40.3	50.75
Sugar	57.9	48.21
Cellulose	0.24	0.00
Salt	1.38	0.94
Preventol	0.18	0.10

7. 900MHz Validation Measurement

Simulated tissue liquid parameter

7-a Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

7-b Muscle 900MHz

Test date	:	**March 27, 2011**	**March 28, 2011**	**April 22, 2011**
Ambient temperature (deg.c.)	:	**24.5**	**24.5**	**24.5**
Relative Humidity (%)	:	**37**	**40**	**36**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS

Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
		Before	After					
27-Mar	835	23.0	23.0	Relative Permittivity εr	55.2	54.5	-1.3	+/-5
				Coductivity σ [mho/m]	0.97	0.96	-1.0	+/-5
27-Mar	900	23.0	23.0	Relative Permittivity εr	55.0	53.9	-2.0	+/-5
				Coductivity σ [mho/m]	1.05	1.04	-1.0	+/-5
28-Mar	835	23.0	23.0	Relative Permittivity εr	55.2	55.1	-0.2	+/-5
				Coductivity σ [mho/m]	0.97	0.96	-1.0	+/-5
28-Mar	900	23.0	23.0	Relative Permittivity εr	55.0	54.8	-0.4	+/-5
				Coductivity σ [mho/m]	1.05	1.05	0.0	+/-5
22-Apr	835	23.0	23.0	Relative Permittivity εr	55.2	53.8	-2.5	+/-5
				Coductivity σ [mho/m]	0.97	0.96	-1.0	+/-5
22-Apr	900	23.0	23.0	Relative Permittivity εr	55.0	53.9	-2.0	+/-5
				Coductivity σ [mho/m]	1.05	1.03	-1.9	+/-5

*1 The target values is a parameter defined in FCC OET 65

DIELECTRIC PARAMETERS MEASUREMENT RESULTS

Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value*2	Measured	Deviation [%]	Limit [%]
		Before	After					
27-Mar	900	23.0	23.0	Relative Permittivity εr	53.6	53.9	0.6	+/-6
				Coductivity σ [mho/m]	1.05	1.04	-1.0	+/-6
28-Mar	900	23.0	23.0	Relative Permittivity εr	53.6	54.8	2.2	+/-6
				Coductivity σ [mho/m]	1.05	1.05	0.0	+/-6
22-Apr	900	23.0	23.0	Relative Permittivity εr	53.6	53.9	0.6	+/-6
				Coductivity σ [mho/m]	1.05	1.03	-1.9	+/-6

*2 The target value is the calibrated dipole Body TSL parameters. **(**D900V2 SN:155,Measured Body TSL Parameters)

8. 900 System validation data

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are in the table below. Please refer to APPENDIX3.

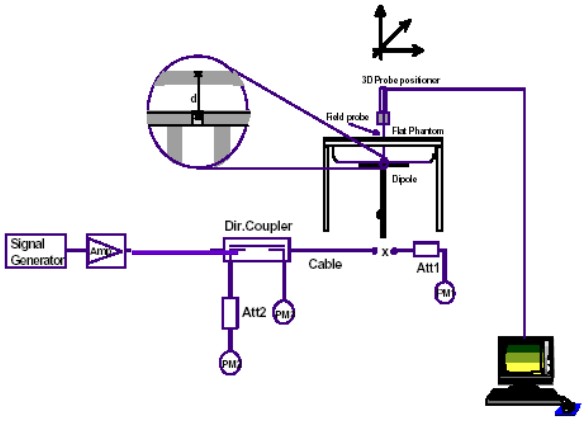
8-a 900MHz System validation

Frequency	:	**900MHz**		
Dipole	:	**D900V2 SN:155**		
Power	:	**250mW**		
Test date	:	**March 27, 2011**	**March 28, 2011**	**April 22, 2011**
Liquid depth (cm)	:	**15.0**	**15.0**	**15.0**
Ambient temperature (deg.c.)	:	**24.5**	**24.5**	**24.5**
Relative Humidity (%)	:	**37**	**40**	**36**

SYSTEM PERFORMANCE CHECK											
Date	Liquid (900MHz)							System dipole validation target & measured			
	Type	Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
		Before	After	Target*1	Measured	Target*1	Measured	Target*2	Measured		
27-Mar	Body	23.0	23.0	53.6	53.9	1.05	1.04	2.73	2.63	-3.7	+/-10
28-Mar	Body	23.0	23.0	53.6	54.8	1.05	1.05	2.73	2.73	0.0	+/-10
22-Apr	Body	23.0	23.0	53.6	53.9	1.05	1.03	2.73	2.54	-7.0	+/-10

*1 The target value is the calibrated dipole Body TSL parameters. (D900V2 SN:155).
*2 The taget value is 1/4 values of 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D900V2 SN:155),because the forward power of the dipole was checked with 250mW,

Note: Please refer to Attachment for the result representation in plot format



Test system for the system performance check setup diagram

900MHz System performance check setup

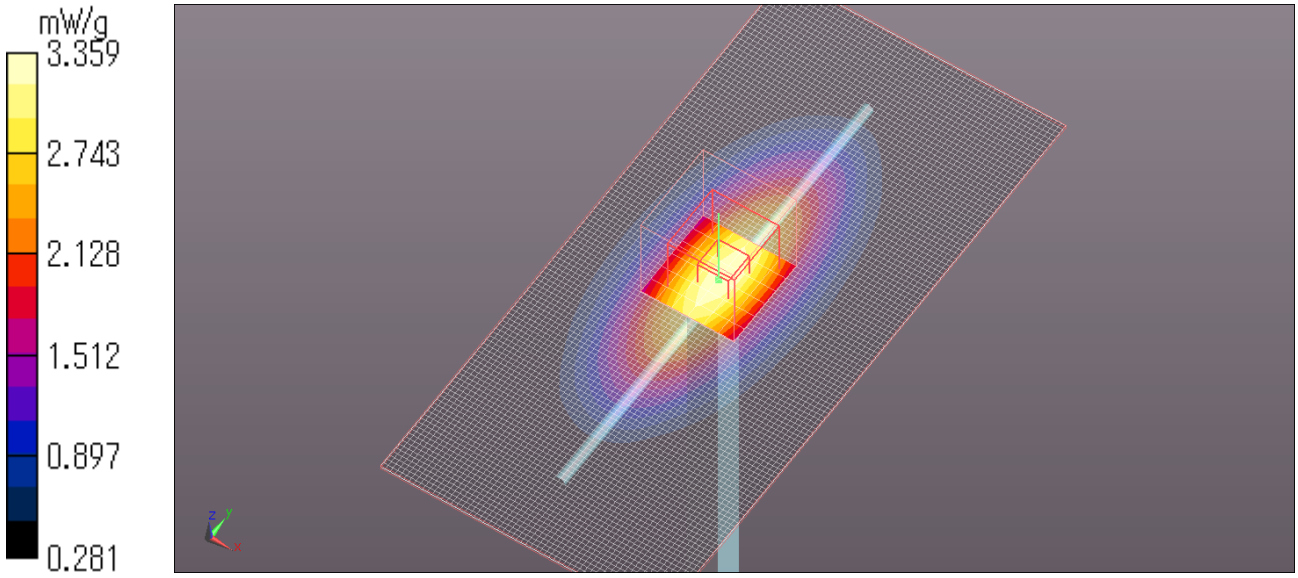
9. 900MHz Validation Measurement data
Body / 900MHz System Validation / Forward Conducted Power : 250mW
Dipole 900 MHz; Type: D900V2; Serial: 155

Communication System: CW; Communication System Band: D900 (900.0 MHz); Frequency: 900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 900 MHz; σ = 1.04 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:
Probe: EX3DV3 - SN3507; ConvF(10.18, 10.18, 10.18); Calibrated: 2011/03/16
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2010/07/07
Phantom: ELI 4.0; Type: QDOVA001BA;
Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Area Scan (61x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.349 mW/g

Zoom Scan (7x7x7) 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.817 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 4.005 W/kg
SAR(1 g) = 2.63 mW/g; SAR(10 g) = 1.71 mW/g
Maximum value of SAR (measured) = 3.359 mW/g

Test Date = 03/27/2011
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.0 degree.C , After 23.0 degree.C



Body / 900MHz System Validation / Forward Conducted Power : 250mW
Dipole 900 MHz; Type: D900V2; Serial: 155

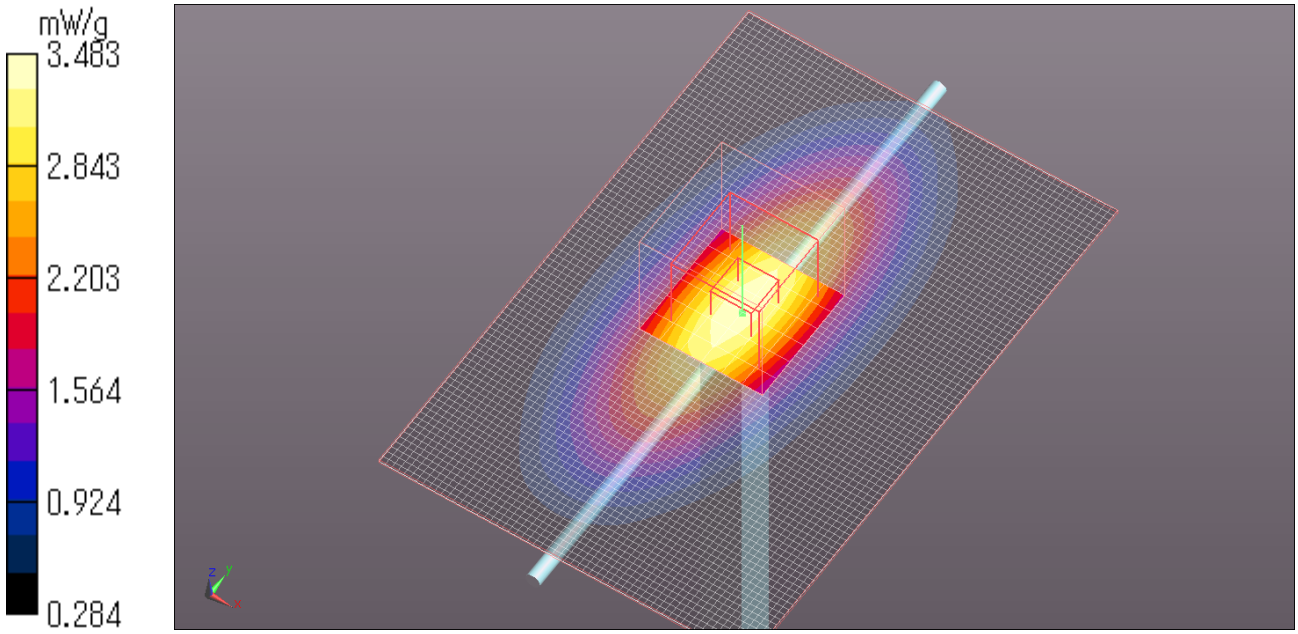
Communication System: CW; Communication System Band: D900 (900.0 MHz); Frequency: 900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 900 MHz; σ = 1.05 mho/m; ε_r = 54.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:
Probe: EX3DV3 - SN3507; ConvF(10.18, 10.18, 10.18); Calibrated: 2011/03/16
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2010/07/07
Phantom: ELI 4.0; Type: QDOVA001BA;
Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.493 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.575 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 4.148 W/kg

SAR(1 g) = 2.73 mW/g; SAR(10 g) = 1.76 mW/g
Maximum value of SAR (measured) = 3.483 mW/g

Test Date = 03/28/2011
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.0 degree.C , After 23.0 degree.C



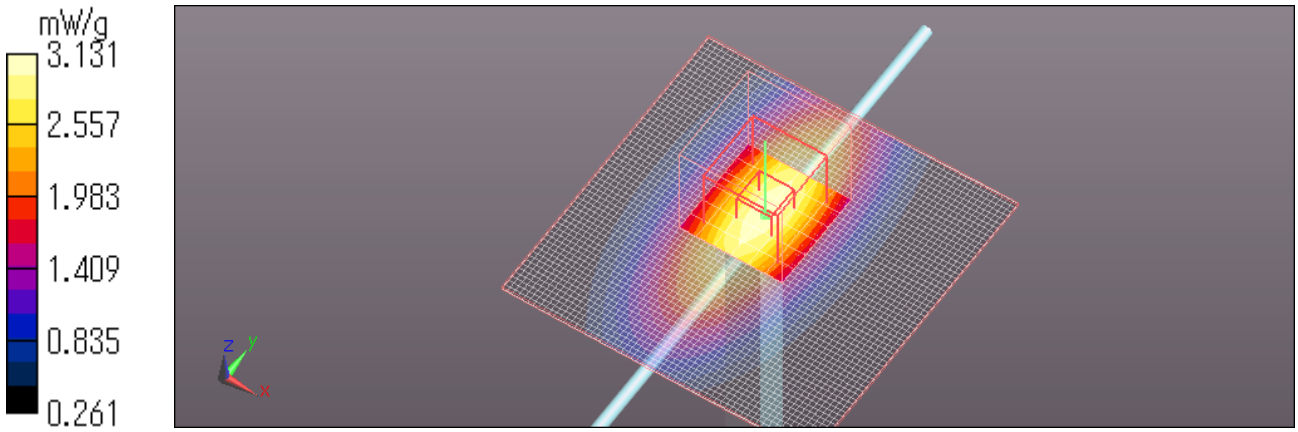
Body / 900MHz System Validation / Forward Conducted Power : 250mW
Dipole 900 MHz; Type: D900V2; Serial: 155

Communication System: CW; Communication System Band: D900 (900.0 MHz); Frequency: 900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 900 MHz; σ = 1.03 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:
Probe: EX3DV3 - SN3507; ConvF(10.18, 10.18, 10.18); Calibrated: 2011/03/16
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2010/07/07
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.216 mW/g

Zoom Scan (7x7x7) 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.536 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.741 W/kg
SAR(1 g) = 2.54 mW/g; SAR(10 g) = 1.68 mW/g
Maximum value of SAR (measured) = 3.131 mW/g

Test Date = 04/22/011
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.0 degree.C , After 23.0 degree.C



10. 1800MHz Simulated Tissues Composition

Ingredient	MiXTURE(%)	
	Head 1800MHz	Muscle 1800MHz
Water	55.24	70.17
DGMBE	44.45	29.44
Salt	0.31	0.39

Note:DGMBE(Diethylenglycol-monobuthyl ether)

11. 1800MHz Validation Measurement

Simulated tissue liquid parameter

11-a Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

11-b Muscle 1800MHz

Test date	:	**March 29, 2011**	**April 21, 2011**
Ambient temperature (deg.c.)	:	**24.5**	**24.5**
Relative Humidity (%)	:	**40**	**42**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *1	Measured	Deviation [%]	Limit [%]
		Before	After					
29-Mar	1800	22.5	22.5	Relative Permittivity εr	53.3	52.5	-1.5	+/-5
				Coductivity σ [mho/m]	1.52	1.53	0.7	+/-5
29-Mar	1880	22.5	22.5	Relative Permittivity εr	53.3	52.1	-2.3	+/-5
				Coductivity σ [mho/m]	1.52	1.59	4.6	+/-5
21-Apr	1800	22.5	22.5	Relative Permittivity εr	53.3	53.8	0.9	+/-5
				Coductivity σ [mho/m]	1.52	1.52	0.0	+/-5
21-Apr	1880	22.5	22.5	Relative Permittivity εr	53.3	53.4	0.2	+/-5
				Coductivity σ [mho/m]	1.52	1.59	4.6	+/-5

*1 The target values is a parameter defined in FCC OET 65

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *2	Measured	Deviation [%]	Limit [%]
		Before	After					
31-Mar	1800	22.5	22.5	Relative Permittivity εr	52.9	52.5	-0.8	+/-6
				Coductivity σ [mho/m]	1.45	1.53	5.5	+/-6
21-Apr	1800	22.5	22.5	Relative Permittivity εr	52.9	53.8	1.7	+/-6
				Coductivity σ [mho/m]	1.45	1.52	4.8	+/-6

*2 The target value is the calibrated dipole Body TSL parameters. (D1800V2 SN:2d04, Measured Body TSL parameters)

12. 1800MHz and 1900MHz System validation data

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are in the table below. Please refer to APPENDIX3.

12-a 1800MHz System validation

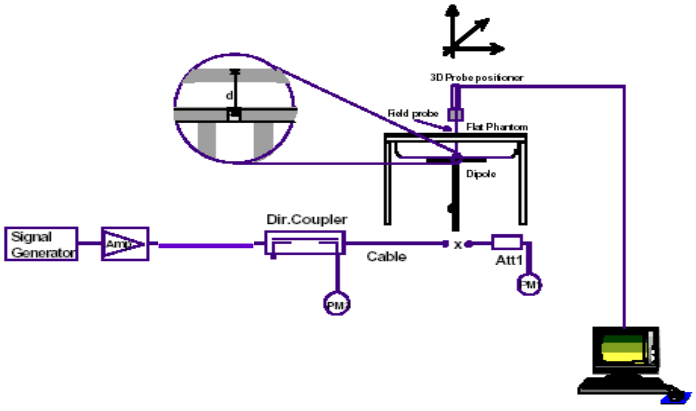
Frequency	:	**1800MHz**	
Dipole	:	**D1800V2 SN:2d04**	
Power	:	**250mW**	
Test date	:	**March 29, 2011**	**April 21, 2011**
Liquid depth (cm)	:	**15.0**	**15.0**
Ambient temperature (deg.c.)	:	**24.5**	**24.5**
Relative Humidity (%)	:	**40**	**42**

SYSTEM PERFORMANCE CHECK

Date	Liquid (1800MHz)							System dipole validation target & measured			
	Type	Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
		Before	After	Target	Measured	Target	Measured	Target*2	Measured		
29-Mar	Body	22.5	22.5	53.1	52.5	1.45	1.53	9.60	8.77	-8.6	+/-10
21-Apr	Body	22.5	22.5	53.1	53.8	1.45	1.52	9.60	10.3	7.3	+/-10

*1 The target value is the calibrated dipole Body TSL parameters. (D1800V2 SN:2d04).
*2 The taget value is 1/4 values of 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D1800V2 SN:2d04),because the forward power of the dipole was checked with 250mW.

Note: Please refer to Attachment for the result representation in plot format



Test system for the system performance check setup diagram

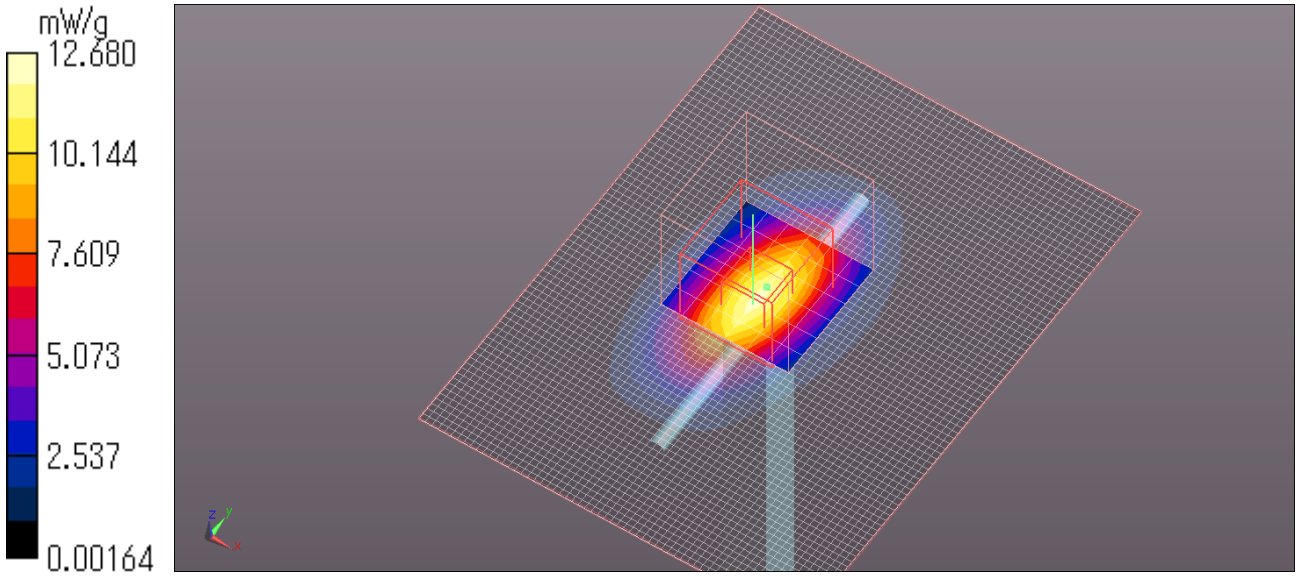
1800MHz System performance check setup

13. 1800MHz Validation Measurement data
Body/ 1800MHz System Validation / Forward Conducted Power : 250mW
Dipole 1800 MHz; Type: D1800V2; Serial: 2d04
Communication System: CW; Communication System Band: D1800 (1800.0 MHz); Frequency: 1800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1800 MHz; σ = 1.52 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:
Probe: EX3DV3 - SN3507; ConvF(8.25, 8.25, 8.25); Calibrated: 2011/03/16
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2010/07/07
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 12.680 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.877 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 15.563 W/kg
SAR(1 g) = 8.77 mW/g; SAR(10 g) = 4.66 mW/g
Maximum value of SAR (measured) = 12.408 mW/g

Test Date = 03/29/2011
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 22.5 degree.C , After 22.5 degree.C

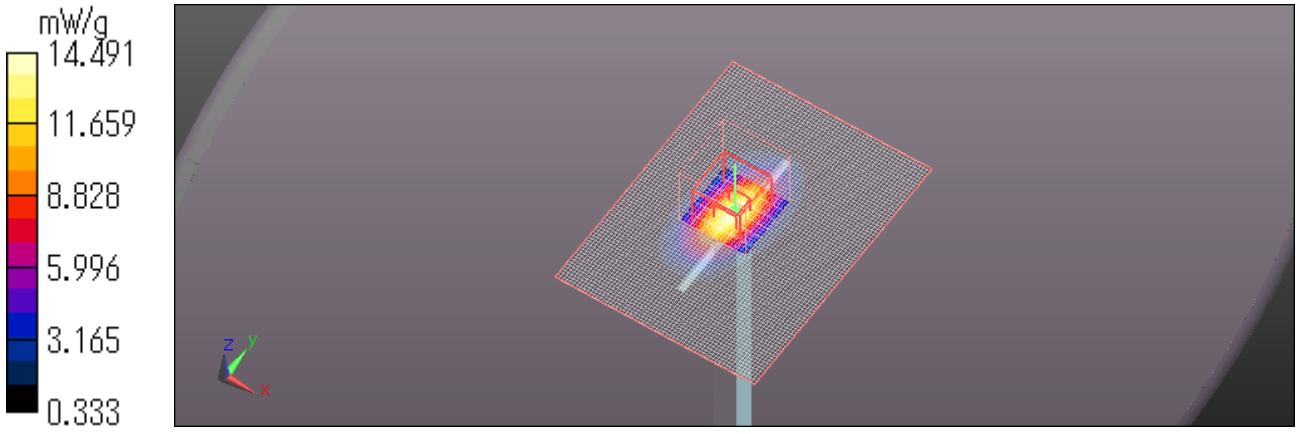


Body/ 1800MHz System Validation / Forward Conducted Power : 250mW
Dipole 1800 MHz; Type: D1800V2; Serial: 2d04
Communication System: CW; Communication System Band: D1800 (1800.0 MHz); Frequency: 1800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1800 MHz; σ = 1.53 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:
Probe: EX3DV3 - SN3507; ConvF(8.25, 8.25, 8.25); Calibrated: 2011/03/16
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2010/07/07
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.768 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.376 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.187 W/kg
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.47 mW/g
Maximum value of SAR (measured) = 14.491 mW/g

Test Date = 04/21/2011
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 22.5 degree.C , After 22.5 degree.C



14. 2450MHz Simulated Tissues Composition

Ingredient	MiXTURE(%)	
	Head 2450MHz	Muscle 2450MHz
Water	55.0	68.64
DGMBE	45.0	31.37

Note:DGMBE(Diethylenglycol-monobuthyl ether)

15. 2450MHz Validation Measurement

Simulated tissue liquid parameter

15-a Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

15-b Muscle 2450 MHz

Test date	:	**March 28, 2011**	**April 25, 2011**
Ambient temperature (deg.c.)	:	**24.5**	**24.5**
Relative Humidity (%)	:	**40**	**41**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *1	Measured	Deviation [%]	Limit [%]
		Before	After					
28-Mar	2450	24.0	24.0	Relative Permittivity εr	52.7	52.1	-1.1	+/-5
				Coductivity σ [mho/m]	1.95	2.01	3.1	+/-5
25-Apr	2450	24.5	24.5	Relative Permittivity εr	52.7	51.4	-2.5	+/-5
				Coductivity σ [mho/m]	1.95	1.95	0.0	+/-5

*1 The target values is a parameter defined in FCC OET 65.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *2	Measured	Deviation [%]	Limit [%]
		Before	After					
28-Mar	2450	24.0	24.0	Relative Permittivity εr	52.5	52.1	-0.8	+/-6
				Coductivity σ [mho/m]	1.95	2.01	3.1	+/-6
25-Apr	2450	24.5	24.5	Relative Permittivity εr	52.5	51.4	-2.1	+/-6
				Coductivity σ [mho/m]	1.95	1.95	0.0	+/-6

*2 The target value is the calibrated dipole Body TSL parameters. (D2450V2 SN:713,Measured Body TSL parameters)

16. 2450MHz System validation data

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are in the table below. Please refer to APPENDIX3.

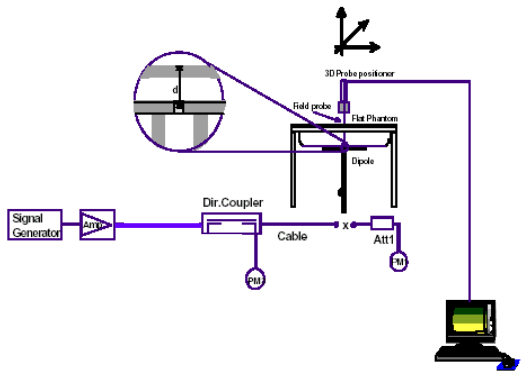
System validation of 2450MHz

Frequency	:	**2450MHz**	
Dipole	:	**D2450V2 SN:713**	
Power	:	**250mW**	
Test date	:	**March 28, 2011**	**April 21, 2011**
Liquid depth (cm)	:	**15.0**	**15.0**
Ambient temperature (deg.c.)	:	**24.5**	**24.5**
Relative Humidity (%)	:	**40**	**42**

SYSTEM PERFORMANCE CHECK

Date	Liquid (Body 2450MHz)						System dipole validation target & measured			
	Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
	Before	After	Target*1	Measured	Target*1	Measured	Target*2	Measured		
28-Mar	24.0	24.0	52.5	52.1	1.95	2.01	12.98	13.3	2.5	+/-10
25-Apr	24.5	24.5	52.5	51.4	1.95	1.95	12.98	13.0	0.2	+/-10

*1 The target value is the calibrated dipole Body TSL parameters. (D2450V2 SN:713)
*2 The target value is 1/4 values of 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D2450V2 SN:713),because the forward power of the dipole was checked with 250mW.
Note: Please refer to Attachment for the result representation in plot format



Test system for the system performance check setup diagram

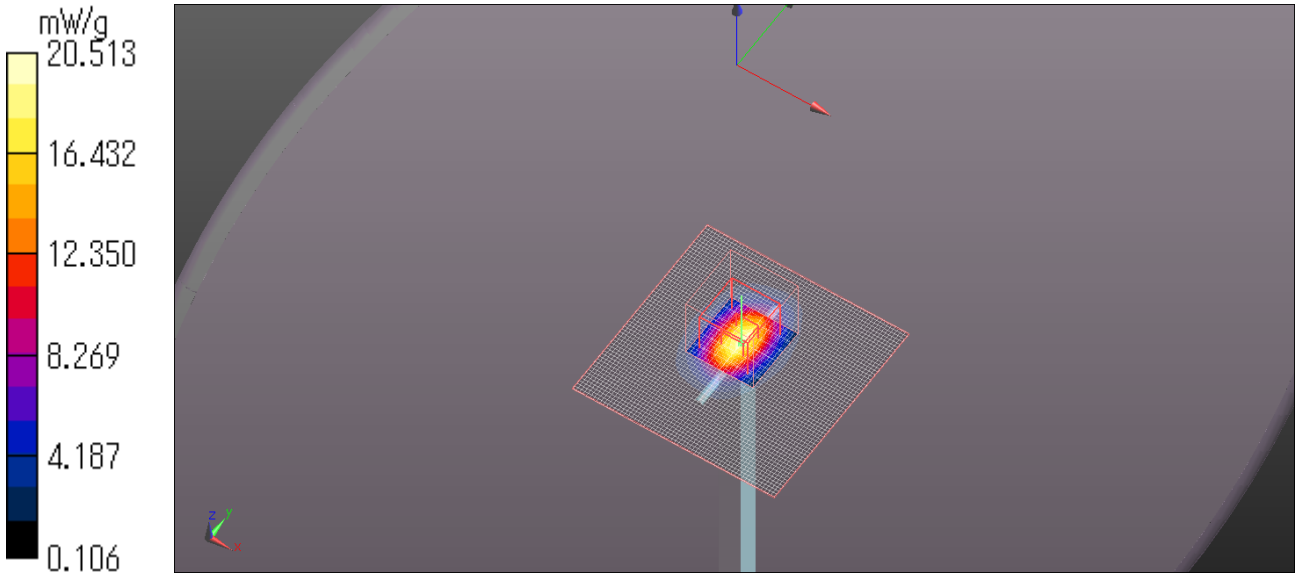
2450MHz System performance check setup

17. 2450MHz Validation Measurement data
Body /2450MHz System Validation Forward Conducted Power : 250mW
Dipole 2450 MHz; Type: D2450V2; Serial:713
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:
Probe: EX3DV3 - SN3507; ConvF(7.61, 7.61, 7.61); Calibrated: 2011/03/16
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2010/07/07
Phantom: ELI 4.0; Type: QDOVA001BA;
Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 22.071 mW/g

Zoom Scan (7x7x7) 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.5 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 28.471 W/kg
SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.01 mW/g
Maximum value of SAR (measured) = 20.513 mW/g

Test Date = 03/28/2011
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C , After 24.0 degree.C

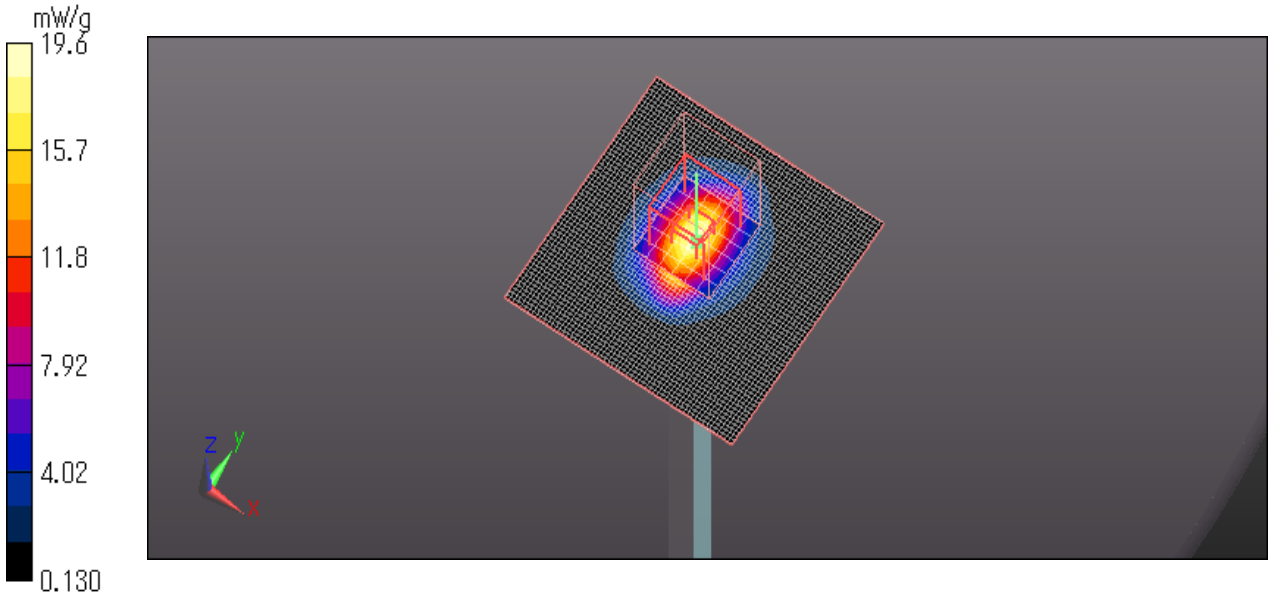


Body /2450MHz System Validation Forward Conducted Power : 250mW
Dipole 2450 MHz; Type: D2450V2; Serial:713
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.95 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:
Probe: EX3DV3 - SN3507; ConvF(7.61, 7.61, 7.61); Calibrated: 2011/03/16
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2010/07/07
Phantom: ELI 4.0; Type: QDOVA001BA;
Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Area Scan (51x51x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 24.5 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.6 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 26.1 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.01 mW/g
Maximum value of SAR (measured) = 19.6 mW/g

Test Date = 04/21/2011
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.5 degree.C , After 24.5 degree.C



18. Validation uncertainty

The uncertainty budget has been determined for the DASY5 measurement system according to the SPEAG documents[6] and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±6.55	Normal	1	1	±6.55	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	1	±2.7	∞
Spherical isotropy of the probe	±9.6	Rectangular	0	0	0	∞
Boundary effects	±1.0	Rectangular	√3	1	±1.2	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	Normal	1	1	±0.3	∞
Response time	0	Rectangular	√3	1	0	∞
Integration time	0	Rectangular	√3	1	0	∞
RF ambient Noise	±1.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±1.0	Rectangular	√3	1	±1.7	∞
Probe Positioner	±0.8	Rectangular	√3	1	±0.5	∞
Probe positioning	±6.7	Rectangular	√3	1	±3.9	∞
Algorithms for Max.SAR Eval.	±2.0	Rectangular	√3	1	±1.2	∞
Dipole						
Deviation of exp.dipole	±5.5	Rectangular	√3	1	±3.2	∞
Dipole Axis to Liquid Distance	±2.0	Rectangular	√3	1	±1.2	∞
Input power and SAR drift meas.	±3.4	Rectangular	√3	1	±2.7	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
SAR correction	±1.9	Rectangular	√3	1	±1.1	
Liquid conductivity (target)	±5.0	Rectangular	√3	0.78	±2.3	∞
Liquid conductivity (meas.)	±5.0	Rectangular	1	0.26	±1.3	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.78	±2.3	∞
Liquid permittivity (meas.)	±5.0	Rectangular	1	0.23	±1.2	∞
Combined Standard Uncertainty					**±11.01**	
Expanded Uncertainty (k=2)					**±22.02**	

19. System Validation Dipole (D900V2,S/N: 155)

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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 **UL Japan (PTT)**

Certificate No: **D900V2-155_Dec10**

CALIBRATION CERTIFICATE

Object: D900V2 - SN: 155

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

Calibration date: December 06, 2010

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-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

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-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 7, 2010

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

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

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
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	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.2 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.95 mho/m ± 6 %
Head TSL temperature during test	(21.0 ± 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	2.70 mW / g
SAR normalized	normalized to 1W	10.8 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**10.9 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.73 mW / g
SAR normalized	normalized to 1W	6.92 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.98 mW /g ± 16.5 % (k=2)**

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	1.05 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.75 mW / g
SAR normalized	normalized to 1W	11.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**10.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.77 mW / g
SAR normalized	normalized to 1W	7.08 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**7.05 mW / g ± 16.5 % (k=2)**

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.0 Ω - 9.8 jΩ
Return Loss	- 20.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.4 Ω - 11.6 jΩ
Return Loss	- 18.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.393 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	March 01, 2002

DASY5 Validation Report for Head TSL

Date/Time: 06.12.2010 10:26:37

Test Laboratory: SPEAG, Zurich, Switzerland

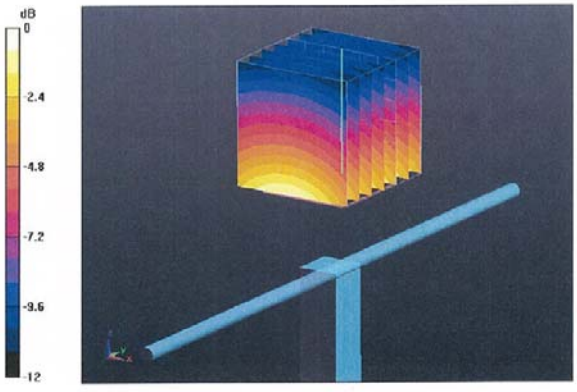
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:155

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 900 MHz; σ = 0.95 mho/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.88, 5.88, 5.88); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

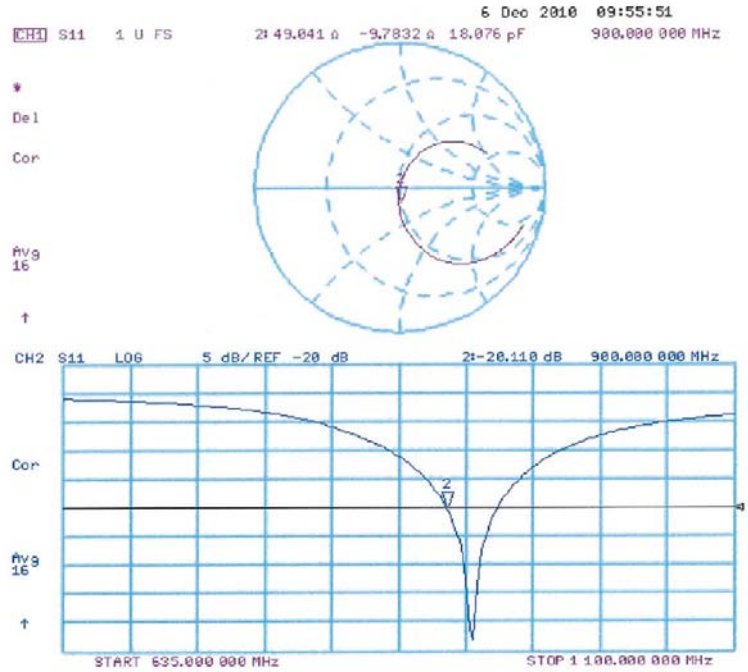
Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.3 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 4.1 W/kg
SAR(1 g) = 2.7 mW/g; SAR(10 g) = 1.73 mW/g
Maximum value of SAR (measured) = 3.16 mW/g



0 dB = 3.16mW/g

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 06.12.2010 12:58:52

Test Laboratory: SPEAG, Zurich, Switzerland

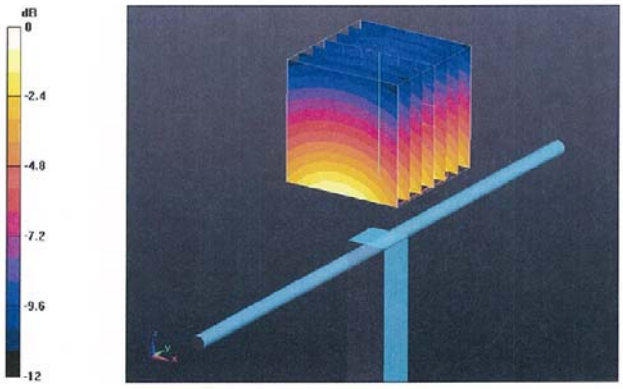
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:155

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: M900
Medium parameters used: f = 900 MHz; σ = 1.05 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.81, 5.81, 5.81); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

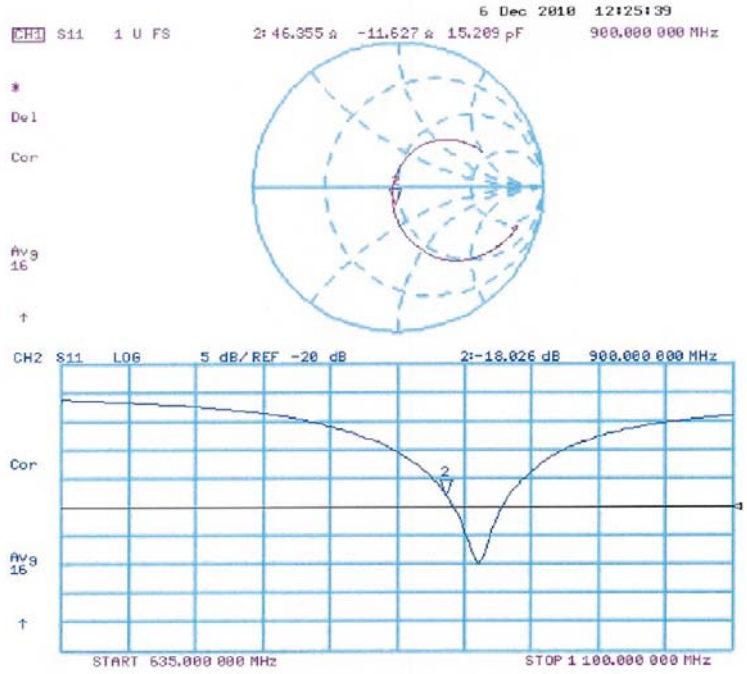
Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.3 V/m; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 4.13 W/kg
SAR(1 g) = 2.75 mW/g; SAR(10 g) = 1.77 mW/g
Maximum value of SAR (measured) = 3.23 mW/g



0 dB = 3.23mW/g

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

Impedance Measurement Plot for Body TSL



20. System Validation Dipole (D1800V2,S/N: 2d04)

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: UL Japan (PTT)

Certificate No: D1800V2-2d040_Dec10

CALIBRATION CERTIFICATE

Object: D1800V2 - SN: 2d040

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

Calibration date: December 09, 2010

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-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

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-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 14, 2010

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

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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
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	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.6 ± 6 %	1.35 mho/m ± 6 %
Head TSL temperature during test	(21.0 ± 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	9.60 mW / g
SAR normalized	normalized to 1W	38.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.04 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.4 mW /g ± 16.5 % (k=2)**

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(21.2 ± 0.2) °C	52.9 ± 6 %	1.45 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.34 mW / g
SAR normalized	normalized to 1W	37.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**38.4 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.98 mW / g
SAR normalized	normalized to 1W	19.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.2 mW / g ± 16.5 % (k=2)**

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Head Office EMC Lab.
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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.8 Ω - 1.9 jΩ
Return Loss	- 33.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.4 Ω - 2.2 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 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	March 27, 2002

DASY5 Validation Report for Head TSL

Date/Time: 07.12.2010 12:17:06

Test Laboratory: SPEAG, Zurich, Switzerland

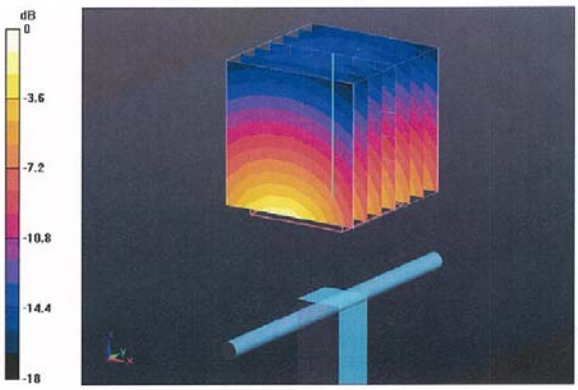
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d040

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 1800 MHz; σ = 1.34 mho/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.05, 5.05, 5.05); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.8 V/m; Power Drift = 0.039 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 9.6 mW/g; SAR(10 g) = 5.04 mW/g
Maximum value of SAR (measured) = 11.9 mW/g



0 dB = 11.9mW/g

UL Japan, Inc.
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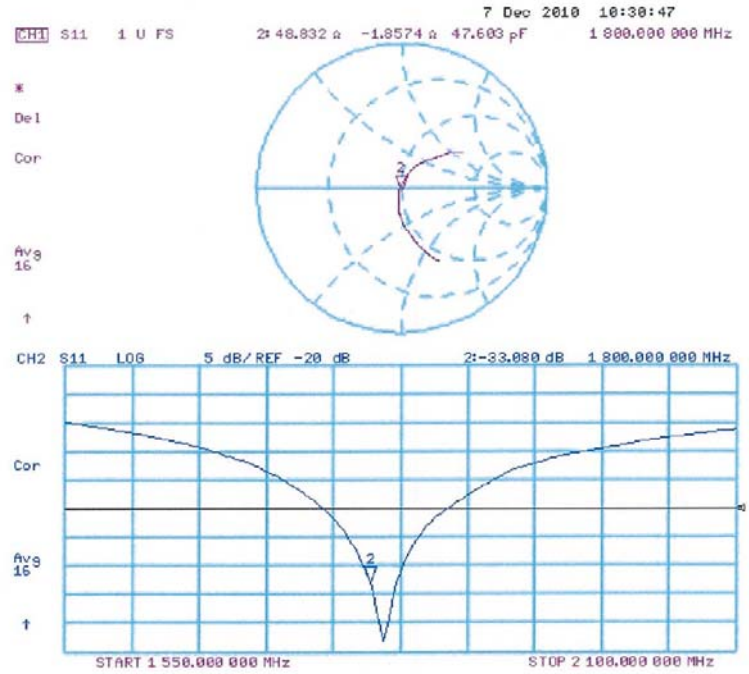
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 09.12.2010 11:14:21

Test Laboratory: SPEAG, Zurich, Switzerland

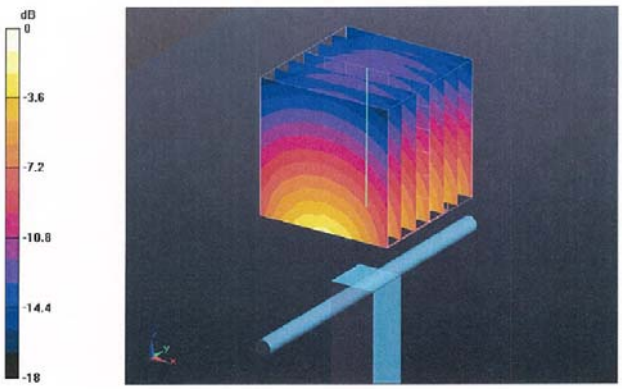
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d040

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 1800 MHz; σ = 1.45 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.74, 4.74, 4.74); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.6 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 16 W/kg
SAR(1 g) = 9.34 mW/g; SAR(10 g) = 4.98 mW/g
Maximum value of SAR (measured) = 11.8 mW/g



0 dB = 11.8mW/g

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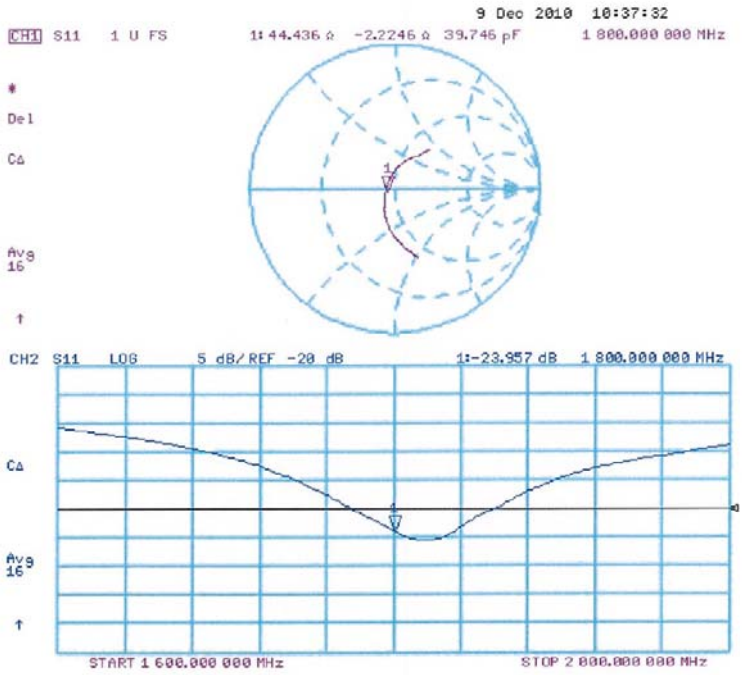
Impedance Measurement Plot for Body TSL



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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
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