

APPENDIX 3 : Test instruments

1. Equipment used

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MURC-02	Wireless Communication Test Set	Agilent	E5515C	GB47050683	Power measurement	2009/10/20 * 36
MPSC-01	Power splitters/Combiners	Mini-Circuit	ZFSC-2-2500	0124	Power measurement	2010/09/17 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	Power measurement	2010/03/01 * 12
MAT-20	Attenuator(10dB)(above 1 GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	Power measurement	2011/01/06 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	Power Measurement	2010/09/10 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	Power Measurement	2010/09/10 * 12
MPM-01	Power Meter	Agilent	E4417A	GB41290639	SAR	2010/02/16 * 12
MPSE-01	Power Sensor	Agilent	E9300B	US40010300	SAR	2010/02/11 * 12
MPSE-03	Power sensor	Agilent	E9327A	US40440576	SAR	2010/02/19 * 12
MAT-15	Attenuator(30dB)	Agilent	8498A	US40010300	SAR	2010/02/24 * 12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2010/09/08 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	SAR	2010/03/16 * 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	2010/02/19 * 12
MRENT-81	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	ET3DV6	1740	SAR	2010/12/14 * 12
MDAE-01	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3 V1	509	SAR	2010/07/07 * 12
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
MPS-01	SAM Phantom	Schmid&Partner Engineering AG	SAM Twin Phantom V4.0	1196	SAR	Pre Check
MDH-01	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-05	Thermo-Hygrometer	Custom	CTH-190	810201	SAR	2010/04/21 * 12
MOS-10	Digital thermometer	HANNA	Checktemp-2	MOS-10	SAR	2010/08/02 * 12
MBM-13	Barometer	Sunoh	SBR121	837	SAR	2008/03/14 * 36
HSL/MSL900					Daily check	Target value $\pm$ 5%
HSL/MSL1800					Daily check	Target value $\pm$ 5%
HSL/MSL2450					Daily check	Target value $\pm$ 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

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

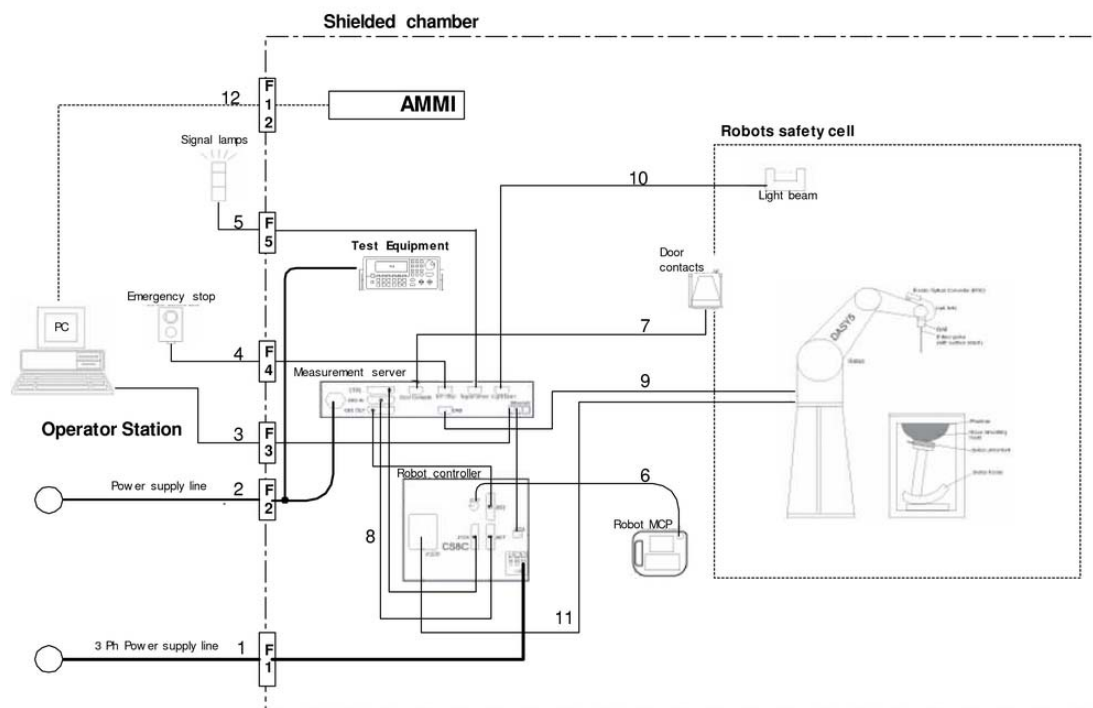
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Facsimile: +81 596 24 8124

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 & ET3DV6 SN: 1741 (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 $\pm 10\%$. 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.

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

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:

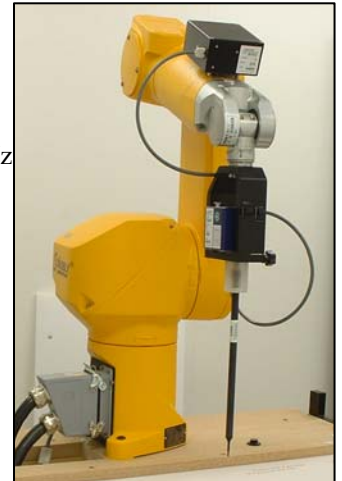
Overall length: 330 mm (Tip: 20 mm)

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

ET3DV6 Probe Specification

Construction:

Symmetrical design with triangular core

Built-in optical fiber for surface detection System

Built-in shielding against static charges

PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)

Calibration (SN:1740):

Conversion Factors : Refer to the calibration data

Frequency:

10 MHz to 3GHz; Linearity: +/-0.2 dB

(30 MHz to 3 GHz)

Directivity:

+/-0.2 dB in brain tissue (rotation around probe axis)

+/-0.4 dB in brain tissue (rotation normal probe axis)

Dimensions:

Overall length: 330 mm (Tip: 16 mm)

Tip length: 16 mm

Body diameter: 12 mm (Body: 12 mm)

Tip diameter: 6.8 mm

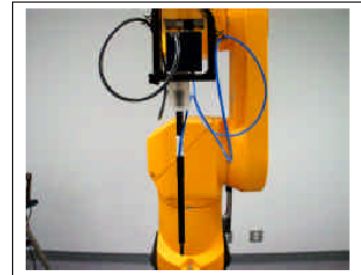
Distance from probe tip to dipole centers: 2.7 mm

Application:

General dosimetric up to 3 GHz

Compliance tests of mobile phones

Fast automatic scanning in arbitrary phantoms



Inside view of
ET3DV6 E-field Probe

SAM Twin Phantom

Construction:

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC EN 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

Shell Thickness:

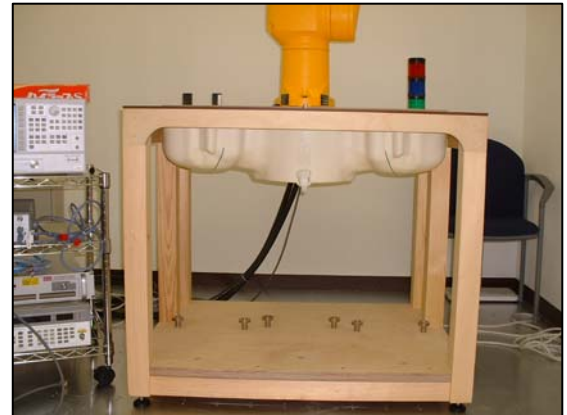
2 +/- 0.2 mm

Filling Volume:

Approx. 25 liters

Dimensions:

(H x L x W): 810 x 1000 x 500 mm



SAM Twin Phantom

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the mounted transmitter

in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations.

To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.



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 DASY4 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 μ V to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 1 μ V (with auto zero)
Input Resistance	:	200 M Ω
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 / ET3DV6
Serial No.	:	3507 / 1741
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	:	SAM Twin Phantom V4.0
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Volume	:	Approx. 25 liters
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 Head 900 MHz

Type of liquid : **Head 900 MHz**
 Ambient temperature (deg.c.) : **24.0**
 Relative Humidity (%) : **40**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *1	Measured	Deviation [%]	Limit [%]
		Before	After					
28-Jan	835	21.5	21.5	Relative Permittivity ϵ_r	41.5	39.7	-4.3	+/-5
				Coductivity σ [mho/m]	0.90	0.88	-2.2	+/-5
28-Jan	900	21.5	21.5	Relative Permittivity ϵ_r	41.5	39.5	-4.8	+/-5
				Coductivity σ [mho/m]	0.97	0.94	-3.1	+/-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-Jan	900	21.5	21.5	Relative Permittivity ϵ_r	40.7	39.5	-2.9	+/-10
				Coductivity σ [mho/m]	0.95	0.94	-1.1	+/-10

*2 The target value is the calibrated dipole Head TSL parameters. (D900V2 SN:155)

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

7-c Muscle 900MHz

Type of liquid : Muscle 900 MHz

Ambient temperature (deg.c.) : 24.0

Relative Humidity (%) : 38

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
		Before	After					
26-Jan	835	22.3	22.3	Relative Permittivity ϵ_r	55.2	52.9	-4.2	+/-5
				Conductivity σ [mho/m]	0.97	0.95	-2.1	+/-5
26-Jan	900	22.3	22.3	Relative Permittivity ϵ_r	55.0	52.4	-4.7	+/-5
				Conductivity σ [mho/m]	1.05	1.07	1.9	+/-5
27-Jan	835	22.3	22.3	Relative Permittivity ϵ_r	55.2	53.0	-4.0	+/-5
				Conductivity σ [mho/m]	0.97	0.95	-2.1	+/-5
27-Jan	900	22.3	22.3	Relative Permittivity ϵ_r	55.0	52.4	-4.7	+/-5
				Conductivity σ [mho/m]	1.05	1.01	-3.8	+/-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					
26-Jan	900	22.5	22.5	Relative Permittivity ϵ_r	53.6	52.4	-2.2	+/-10
				Conductivity σ [mho/m]	1.05	1.07	1.9	+/-10
27-Jan	900	22.5	22.5	Relative Permittivity ϵ_r	53.6	52.4	-2.2	+/-10
				Conductivity σ [mho/m]	1.05	1.01	-3.8	+/-10

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

8. 900MHz 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.

Frequency : **900MHz**
 Liquid depth (cm) : **15.0**
 Ambient temperature (deg.c.) : **24.0(26 to28-Jan)**
 Relative Humidity (%) : **38(26-Jan), 40(27-Jan), 42(28-Jan)**
 Dipole : **D900V2 SN:155**
 Power : **250mW**

SYSTEM PERFORMANCE CHECK											
Date	Type	Liquid (900MHz)						System dipole validation target & measured			
		Liquid Temp [deg.c.]		Relative Permittivity ϵ_r		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
		Before	After	Target*1	Measured	Target*1	Measured	Target*2	Measured		
28-Jan	Head	22.0	22.0	41.5	39.5	0.90	0.94	2.7	2.54	-5.9	+/-10

*1 The target value is the parameter defined in FCC OET 65.

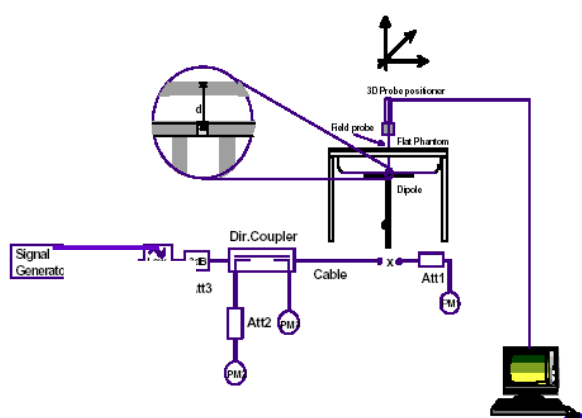
*2 Because the forward power of the dipole was checked with 250mW, the target value is 1/4 values of the parameter defined in IEEE Standard 1528.

SYSTEM PERFORMANCE CHECK											
Date	Type	Liquid (900MHz)						System dipole validation target & measured			
		Liquid Temp [deg.c.]		Relative Permittivity ϵ_r		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
		Before	After	Target*1	Measured	Target*1	Measured	Target*2	Measured		
28-Jan	Head	22.0	22.0	40.7	39.5	0.95	0.94	2.73	2.54	-7.0	+/-10
26-Jan	Body	22.5	22.5	53.6	52.4	1.05	1.07	2.73	2.86	4.8	+/-10
27-Jan	Body	22.5	22.5	53.6	52.4	1.05	1.01	2.73	2.89	5.9	+/-10

*1 The target value is the calibrated dipole Body TSL parameters. (D900V2 SN:155).

*2 The target value is a manufacturer calibrated dipole 1g SAR value. (D900V2 SN:155)

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



900MHz System performance check setup

Test system for the system performance check setup diagram

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

9. 900MHz Validation Measurement data

Head / 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: $f = 900 \text{ MHz}$; $\sigma = 0.94 \text{ mho/m}$; $\epsilon_r = 39.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1740; ConvF(6.39, 6.39, 6.39); Calibrated: 2010/12/14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn509; Calibrated: 2010/07/07
- Phantom: SAM with CRP; Type: SAM
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

System Performance Check HSL/System Performance Check/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.693 mW/g

System Performance Check HSL/System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.749 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 3.777 W/kg

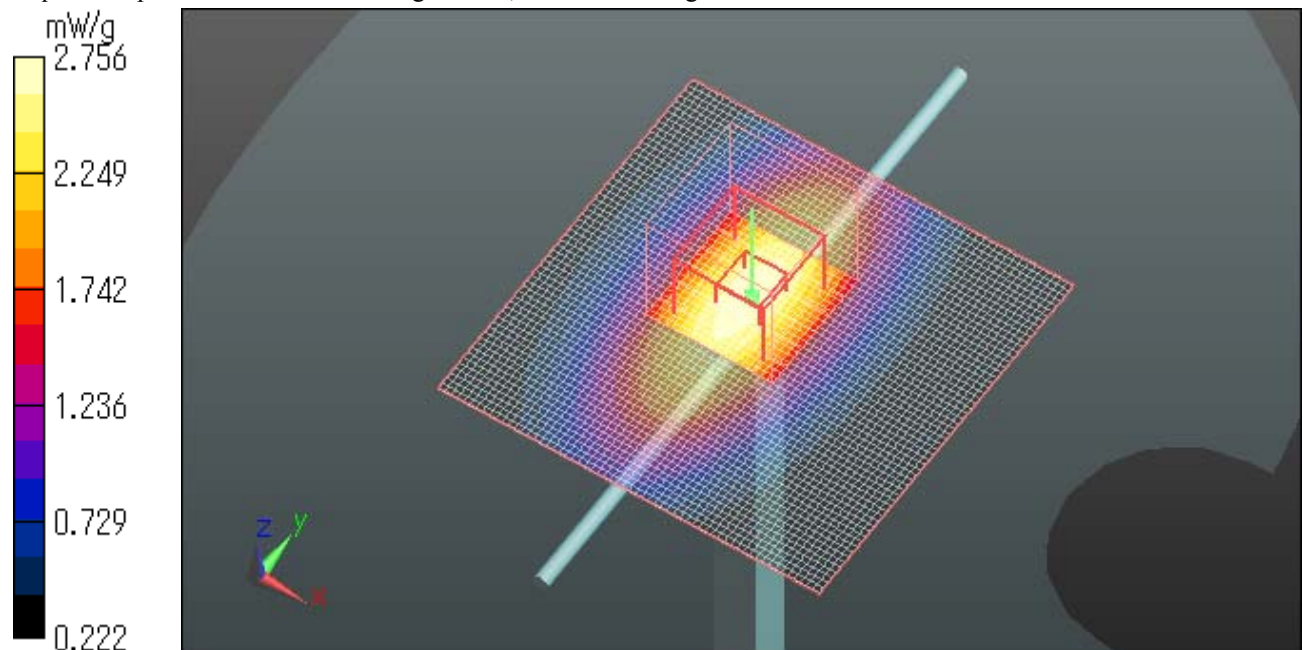
SAR(1 g) = 2.54 mW/g; SAR(10 g) = 1.64 mW/g

Maximum value of SAR (measured) = 2.756 mW/g

Test Date = 1/28/2011

Ambient Temperature = 24.0 degree.C.

Liquid Temperature = Before 21.5 degree.C. , After 21.5 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: $f = 900 \text{ MHz}$; $\sigma = 1.07 \text{ mho/m}$; $\epsilon_r = 52.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3507; ConvF(10.29, 10.29, 10.29); Calibrated: 2010/02/19
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn509; Calibrated: 2010/07/07
- Phantom: SAM with CRP; Type: SAM
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

System Performance Check MSL/System Performance Check/Area Scan (61x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 3.591 mW/g

System Performance Check MSL/System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.285 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 4.331 W/kg

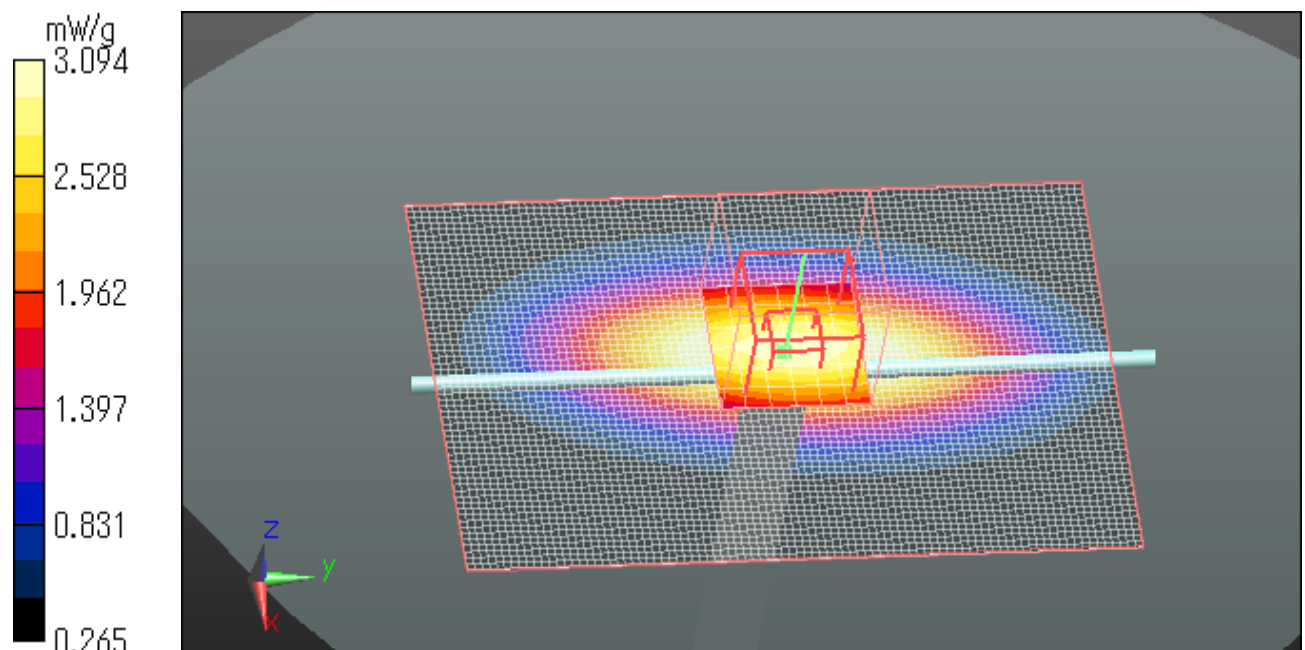
SAR(1 g) = 2.86 mW/g; SAR(10 g) = 1.85 mW/g

Maximum value of SAR (measured) = 3.094 mW/g

Test Date = 1/26/2011

Ambient Temperature = 24.0 degree.C.

Liquid Temperature = Before 22.3 degree.C. , After 22.3 degree.C.



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 / 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: $f = 900 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 52.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3507; ConvF(10.29, 10.29, 10.29); Calibrated: 2010/02/19
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn509; Calibrated: 2010/07/07
- Phantom: SAM with CRP; Type: SAM
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

System Performance Check MSL/System Performance Check/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.552 mW/g

System Performance Check MSL/System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.078 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 4.409 W/kg

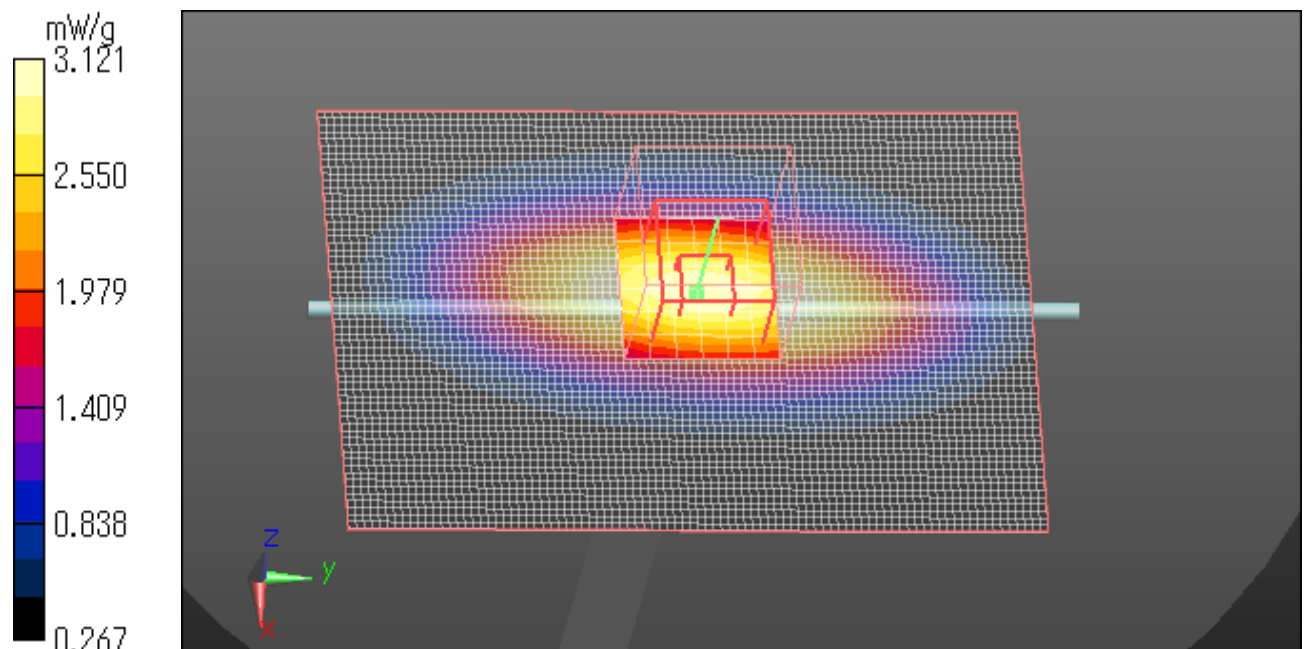
SAR(1 g) = 2.89 mW/g; SAR(10 g) = 1.87 mW/g

Maximum value of SAR (measured) = 3.121 mW/g

Test Date = 1/27/2011

Ambient Temperature = 24.0 degree.C.

Liquid Temperature = Before 21.8 degree.C. , After 21.8 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 Head 1800MHz

Type of liquid : **Head 1800 MHz**

Ambient temperature (deg.c.) : **24.0**

Relative Humidity (%) : **40**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *1	Measured	Deviation [%]	Limit [%]
		Before	After					
27-Jan	1800	22.0	22.0	Relative Permittivity ϵ_r	40.0	39.4	-1.5	+/-5
				Coductivity σ [mho/m]	1.40	1.44	2.9	+/-5
27-Jan	1880	22.0	22.0	Relative Permittivity ϵ_r	40.0	39.7	-0.7	+/-5
				Coductivity σ [mho/m]	1.40	1.47	5.0	+/-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					
27-Jan	1800	22.0	22.0	Relative Permittivity ϵ_r	39.7	39.4	-0.8	+/-10
				Coductivity σ [mho/m]	1.34	1.44	7.5	+/-10

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

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

11-c Muscle 1800MHzType of liquid : **Muscle 1800 MHz**Ambient temperature (deg.c.) : **24.0**Relative Humidity (%) : **38**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *1	Measured	Deviation [%]	Limit [%]
		Before	After					
26-Jan	1800	21.0	21.0	Relative Permittivity ϵ_r	53.3	54.5	2.3	+/-5
				Coductivity σ [mho/m]	1.52	1.47	-3.3	+/-5
26-Jan	1880	21.0	21.0	Relative Permittivity ϵ_r	53.3	54.4	2.1	+/-5
				Coductivity σ [mho/m]	1.52	1.57	3.3	+/-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					
26-Jan	1800	21.0	21.0	Relative Permittivity ϵ_r	53.1	54.5	2.6	+/-5
				Coductivity σ [mho/m]	1.45	1.47	1.4	+/-5

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

12. 1800MHz 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
 Liquid depth (cm) : 15.0
 Ambient temperature (deg.c.) : 24.0(26 and 27-Jan)
 Relative Humidity (%) : 38(26-Jan), 27(40-Jan)
 Dipole : D1800V2 SN:2d04
 Power : 250mW

SYSTEM PERFORMANCE CHECK											
Date	Type	Liquid (1800MHz)						System dipole validation target & measured			
		Liquid Temp [deg.c.]		Relative Permittivity ϵ_r		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
		Before	After	Target*1	Measured	Target*1	Measured	Target*2	Measured		
27-Jan	Head	22.0	22.0	40.0	39.4	1.40	1.44	9.53	9.27	-2.7	+/-10

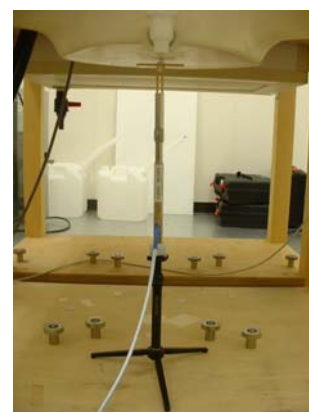
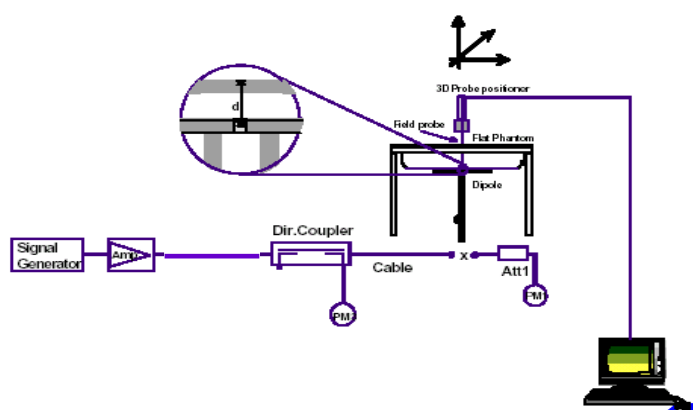
*1 The target value is the parameter defined in FCC OET 65.

*2 Because the forward power of the dipole was checked with 250mW, the target value is 1/4 values of the parameter defined in IEEE Standard 1528.

SYSTEM PERFORMANCE CHECK											
Date	Type	Liquid (1800MHz)						System dipole validation target & measured			
		Liquid Temp [deg.c.]		Relative Permittivity ϵ_r		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
		Before	After	Target	Measured	Target	Measured	Target*2	Measured		
27-Jan	Head	22.0	22.0	39.7	39.4	1.34	1.44	9.83	9.27	-5.7	+/-10
26-Jan	Body	21.0	21.0	53.1	54.5	1.45	1.47	9.60	9.76	1.7	+/-10

*2 The target value is a manufacturer calibrated dipole 1g SAR value. (D1800V2 SN:214)

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



**1800MHz System
performance check setup**

Test system for the system performance check setup diagram

13. 1800MHz Validation Measurement data

HEAD /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: $f = 1800 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 39.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1740; ConvF(5.2, 5.2, 5.2); Calibrated: 2010/12/14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn509; Calibrated: 2010/07/07
- Phantom: SAM with CRP; Type: SAM
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

System Performance Check HSL/System Performance Check/Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 10.636 mW/g

System Performance Check HSL/System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 89.322 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 15.937 W/kg

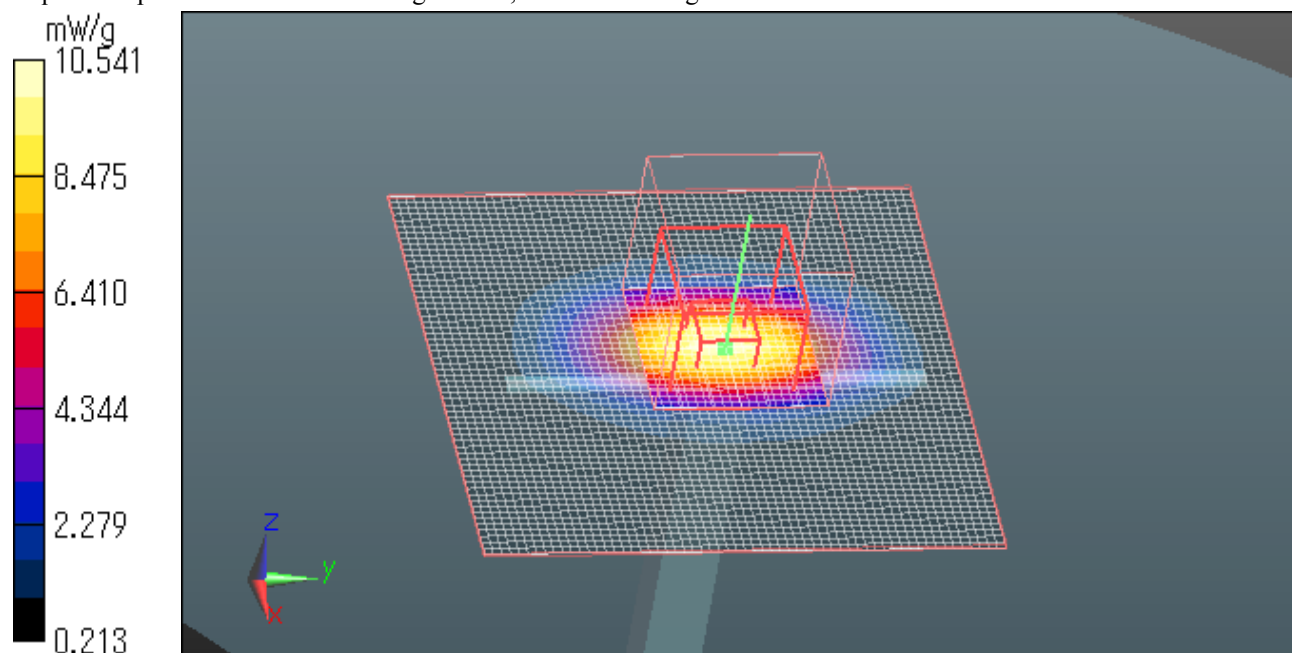
SAR(1 g) = 9.27 mW/g; SAR(10 g) = 4.94 mW/g

Maximum value of SAR (measured) = 10.541 mW/g

Test Date = 1/27/2011

Ambient Temperature = 24.0 degree.C.

Liquid Temperature = Before 22.0 degree.C. , After 22.0 degree.C.



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/ 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; $\sigma = 1.47$ mho/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3507; ConvF(8.47, 8.47, 8.47); Calibrated: 2010/02/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn509; Calibrated: 2010/07/07
- Phantom: SAM with CRP; Type: SAM
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

System Performance Check MSL/System Performance Check/Area Scan (61x61x1): Measurement grid:

$dx=15$ mm, $dy=15$ mm

Maximum value of SAR (interpolated) = 13.717 mW/g

System Performance Check MSL/System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

$dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 95.610 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 17.665 W/kg

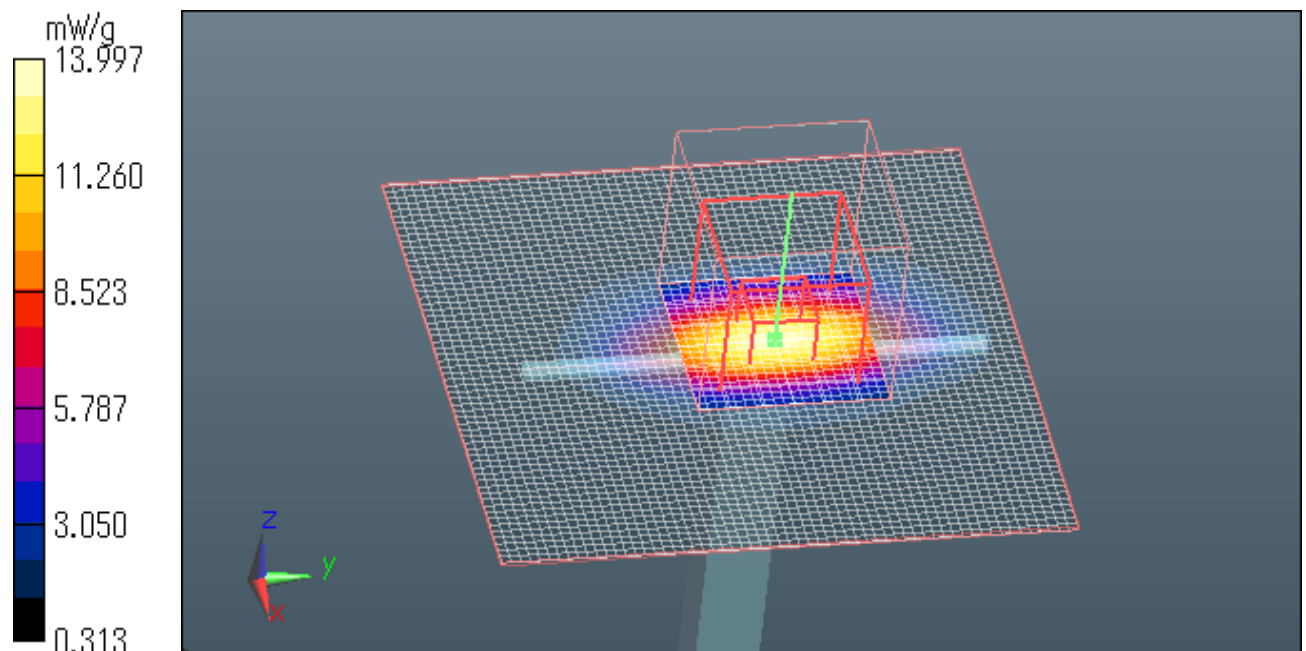
SAR(1 g) = 9.76 mW/g; SAR(10 g) = 5.14 mW/g

Maximum value of SAR (measured) = 13.997 mW/g

Test Date = 1/26/2011

Ambient Temperature = 24.0 degree.C.

Liquid Temperature = Before 21.0 degree.C. , After 21.0 degree.C.



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

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 Head 2450 MHz

Type of liquid : **Head 2450 MHz**
 Ambient temperature (deg.c.) : **24**
 Relative Humidity (%) : **41**
 Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *1	Measured	Deviation [%]	Limit [%]
		Before	After					
20-Nov	2450	22.0	22.0	Relative Permittivity ϵ_r	39.2	38.0	-3.1	+/-5
				Coductivity σ [mho/m]	1.80	1.88	4.4	+/-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 *1	Measured	Deviation [%]	Limit [%]
		Before	After					
20-Nov	2450	22.0	22.0	Relative Permittivity ϵ_r	39.0	38.0	-2.6	+/-10
				Coductivity σ [mho/m]	1.74	1.88	8.0	+/-10

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

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

15-c Muscle 2450 MHzType of liquid : **Muscle 2450 MHz**Ambient temperature (deg.c.) : **24.5**Relative Humidity (%) : **41**Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value *1	Measured	Deviation [%]	Limit [%]
		Before	After					
2-Feb	2450	23.4	23.4	Relative Permittivity ϵ_r	52.7	50.7	-3.8	+/-5
				Coductivity σ [mho/m]	1.95	2.03	4.1	+/-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					
2-Feb	2450	23.4	23.4	Relative Permittivity ϵ_r	52.5	50.7	-3.4	+/-10
				Coductivity σ [mho/m]	1.95	2.03	4.1	+/-10

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

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
 Ambient temperature (deg.c.) : 24.0 (1 and 2-Feb)
 Relative Humidity (%) : 41 (1 and 2-Feb)
 Dipole : D2450V2 SN:713
 Power : 250mW

SYSTEM PERFORMANCE CHECK										
Date	Liquid (HEAD 2450MHz)						System dipole validation target & measured			
	Liquid Temp [deg.c.]		Relative Permittivity ϵ_r		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
	Before	After	Target*1	Measured	Target*1	Measured	Target*2	Measured		
1-Feb	23.2	23.2	39.2	38.0	1.80	1.88	13.1	14.1	7.6	+/-10

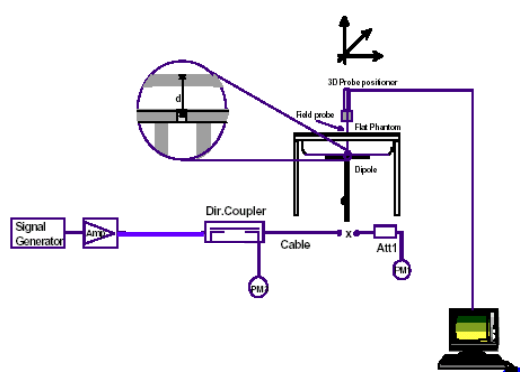
*1 The target value is the parameter defined in FCC OET 65.

*2 Because the forward power of the dipole was checked with 250mW, the target value is 1/4 values of the parameter defined in IEEE Standard 1528.

SYSTEM PERFORMANCE CHECK										
Date	Liquid (Body 2450MHz)						System dipole validation target & measured			
	Liquid Temp [deg.c.]		Relative Permittivity ϵ_r		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
	Before	After	Target	Measured	Target	Measured	Target*2	Measured		
1-Feb	23.2	23.2	39.0	38.0	1.74	1.88	13.1	14.1	7.6	+/-10
2-Feb	23.4	23.4	52.5	50.7	1.95	2.03	12.98	14.0	7.9	+/-10

*2 The target value is a manufacturer calibrated dipole Body SAR value. (D2450V2 SN:713)

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



2450MHz System
performance check setup

Test system for the system performance check setup diagram

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

17. 2450MHz Validation Measurement data

Head /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; $\sigma = 1.88$ mho/m; $\epsilon_r = 38.0$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1740; ConvF(4.68, 4.68, 4.68); Calibrated: 2010/12/14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn509; Calibrated: 2010/07/07
- Phantom: SAM with CRP; Type: SAM
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

System Performance Check HSL/System Performance Check/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 16.683 mW/g

System Performance Check HSL/System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.063 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 28.742 W/kg

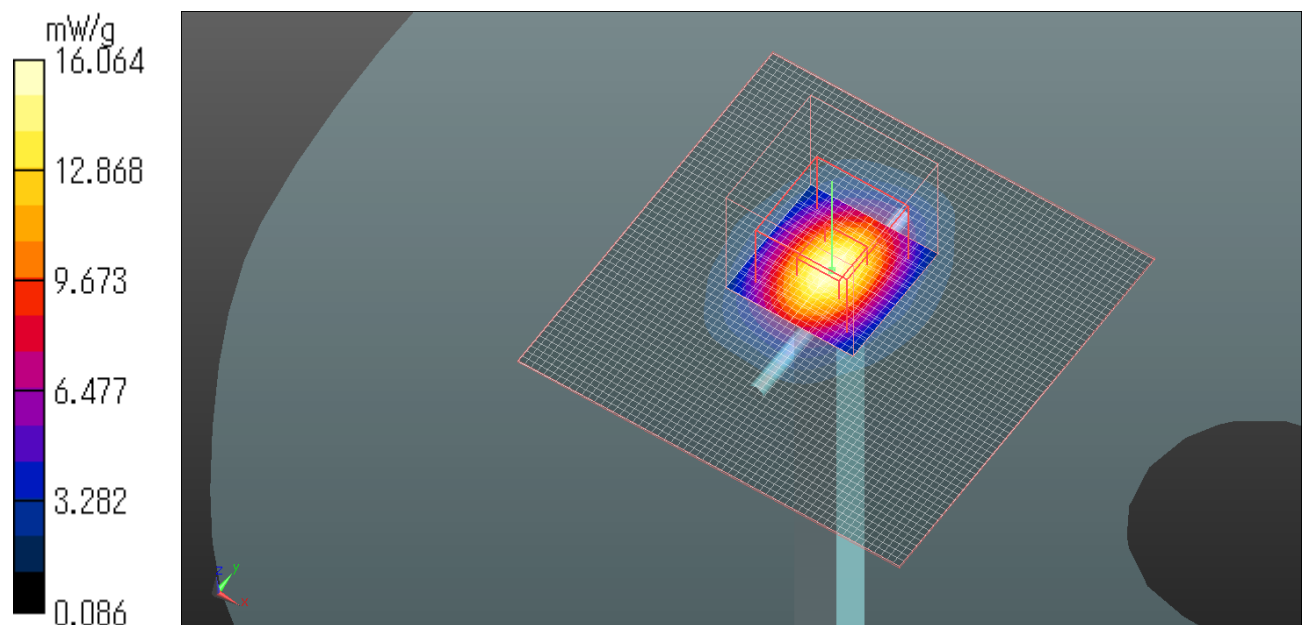
SAR(1 g) = 14.1 mW/g; SAR(10 g) = 6.5 mW/g

Maximum value of SAR (measured) = 16.064 mW/g

Test Date = 2/1/2011

Ambient Temperature = 24.0 degree.C.

Liquid Temperature = Before 23.2 degree.C. , After 23.2 degree.C.



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 /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; $\sigma = 2.03$ mho/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1740; ConvF(3.96, 3.96, 3.96); Calibrated: 2010/12/14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn509; Calibrated: 2010/07/07
- Phantom: SAM with CRP; Type: SAM
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

System Performance Check MSL/System Performance Check/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 15.974 mW/g

System Performance Check MSL/System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.104 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 30.357 W/kg

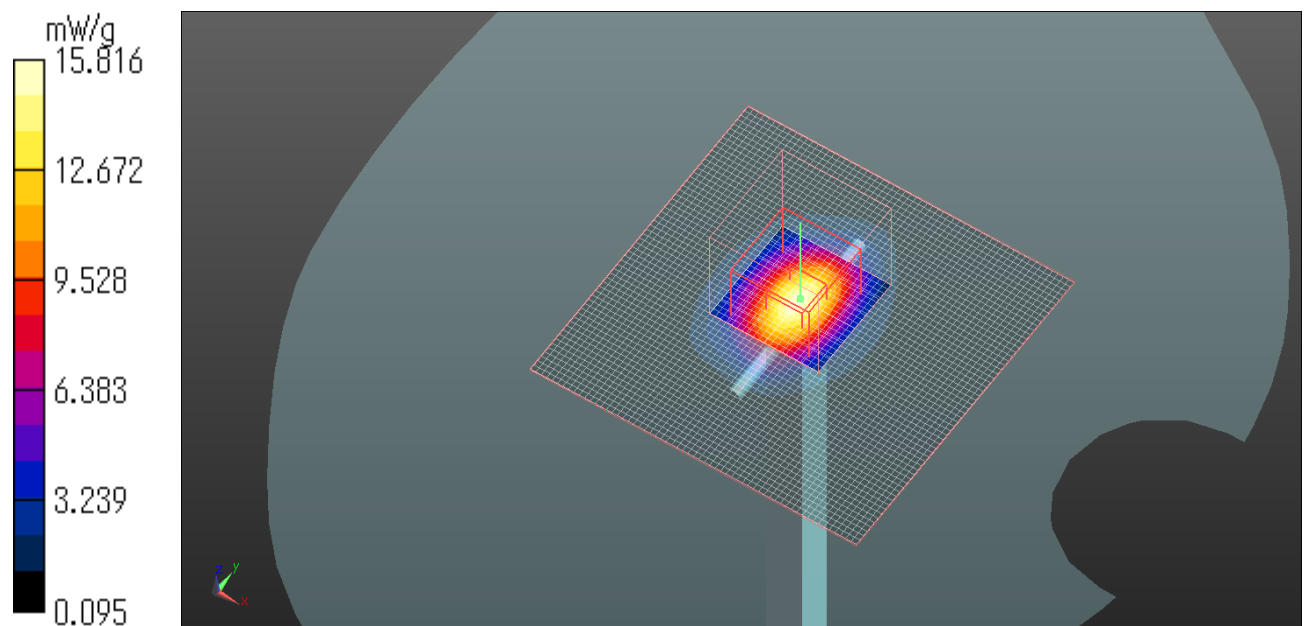
SAR(1 g) = 14 mW/g; SAR(10 g) = 6.45 mW/g

Maximum value of SAR (measured) = 15.816 mW/g

Test Date = 2/2/2011

Ambient Temperature = 24.0 degree.C.

Liquid Temperature = Before 23.4 degree.C. , After 23.4 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 $\pm$ %	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	$\sqrt{3}$	1	± 2.7	∞
Spherical isotropy of the probe	± 9.6	Rectangular	0	0	0	∞
Boundary effects	± 1.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 0.3	Normal	1	1	± 0.3	∞
Response time	0	Rectangular	$\sqrt{3}$	1	0	∞
Integration time	0	Rectangular	$\sqrt{3}$	1	0	∞
RF ambient Noise	± 1.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
RF ambient Reflections	± 1.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Probe Positioner	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Probe positioning	± 6.7	Rectangular	$\sqrt{3}$	1	± 3.9	∞
Algorithms for Max.SAR Eval.	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Dipole						
Deviation of exp.dipole	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Dipole Axis to Liquid Distance	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Input power and SAR drift meas.	± 3.4	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
SAR correction	± 1.9	Rectangular	$\sqrt{3}$	1	± 1.1	
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.78	± 2.3	∞
Liquid conductivity (meas.)	± 5.0	Rectangular	1	0.26	± 1.3	∞
Liquid permittivity (target)	± 5.0	Rectangular	$\sqrt{3}$	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	