APPENDIX 2 : System Validation

1. System validation result Body 2450
Simulated Tissue Liquid Parameter confirmation

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
2-May	24.0	45	MSL 2450	23.5	2450	εr	52.7	51.0	-3.2	+/-5
						σ [mho/m]	1.95	1.97	0.9	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET65.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*2	Measured	Deviation [%]	Limit*3 [%]
2-May	24	45	MSL 2450	23.5	2450	εr	50.5	51.0	1.0	+/-6
						σ [mho/m]	2.01	1.97	-2.1	+/-6

εr: Relative Permittivity / σ : Coductivity
*2 The target value is the calibrated dipole Body TSL parameters. (D2450V2 SN:822, Measured Body TSL parameters)
*3 The limit is for deviation provided by manufacture.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION						
Date	Frequency [MHz]	SAR 1g [W/kg]			Deviation [%]	Limit [%]
		Forward Power 250mW Measured	Conversion 1W Calculation	Target 1W *1		
2-May	2450.00	13.20	52.80	51.20	3.1	+/-10

*1 The taget value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D2450V2 SN:82

SystemPerformanceCheck-D2450
Daily: MSL2450MHz (2450MHz Band)

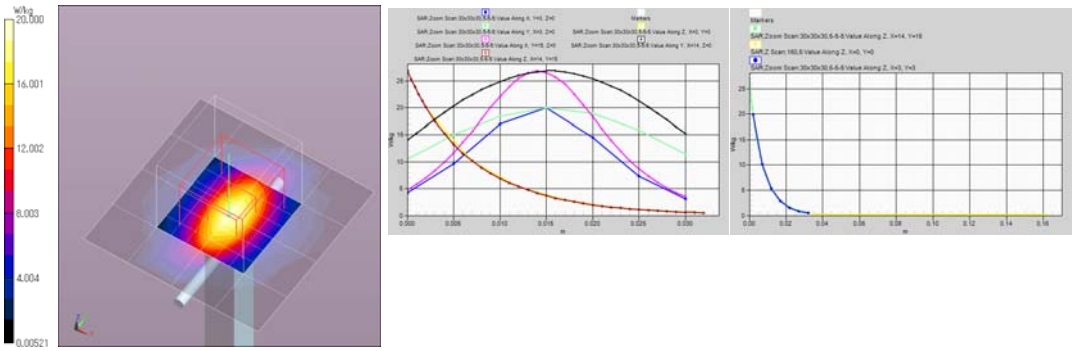
Date/Time: 2013/05/02 9:35:54

DUT: Dipole(2.45GHz); Type: D2450V2; Serial: 822
Communication System: CW; Frequency: 2450 MHz; Crest Factor: 1.0
Medium: M2450; Medium parameters used: f = 2450 MHz; σ = 1.967 S/m; ε_r = 51.021; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:
-Probe: EX3DV4 - SN3679; ConvF(6.77, 6.77, 6.77); Calibrated: 2012/06/21;
-Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0, 161.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area Scan:60x60,15 (5x5x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 20.0 W/kg
Area Scan:60x60,15 (41x41x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 20.0 W/kg
Z Scan;160,5 (1x1x33): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Fast SAR(*.Polynomial fit): SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.23 mW/g

Zoom Scan:30x30x30,5-5-5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.7 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 26.858 mW/g
SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.18 mW/g



Remarks: *. Date tested: 2013/05/02; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 149mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

2. System validation result Body 5GHz

Simulated Tissue Liquid Parameter confirmation

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
22-Apr	24.0	45	MSL 3-6GHz	23.5	5800	εr	48.2	46.1	-4.4	+/-5
						σ [mho/m]	6.00	6.23	3.8	+/-5
23-Apr	24.9	33	MSL 3-6GHz	23.9	5800	εr	48.2	46.3	-4.0	+/-5
						σ [mho/m]	6.00	6.19	3.2	+/-5
24-Apr	24.9	38	MSL 3-6GHz	24.2	5200	εr	49.0	47.1	-3.8	+/-5
						σ [mho/m]	5.30	5.42	2.2	+/-5
26-Apr	24.9	51	MSL 3-6GHz	24.4	5200	εr	49.0	47.0	-4.1	+/-5
						σ [mho/m]	5.30	5.46	3.0	+/-5
26-Apr	24.9	51	MSL 3-6GHz	24.4	5300	εr	48.9	46.9	-4.2	+/-5
						σ [mho/m]	5.42	5.60	3.3	+/-5
27-Apr	24.0	45	MSL 3-6GHz	23.5	5300	εr	48.9	47.5	-2.8	+/-5
						σ [mho/m]	5.42	5.56	2.6	+/-5
27-Apr	24.0	45	MSL 3-6GHz	23.5	5500	εr	48.6	47.5	-2.3	+/-5
						σ [mho/m]	5.65	5.83	3.1	+/-5
27-Apr	24.0	45	MSL 3-6GHz	23.5	5600	εr	48.5	47.3	-2.4	+/-5
						σ [mho/m]	5.77	5.96	3.3	+/-5
30-Apr	24.0	45	MSL 3-6GHz	23.5	5500	εr	48.6	47.5	-2.3	+/-5
						σ [mho/m]	5.65	5.77	2.1	+/-5
30-Apr	24.0	45	MSL 3-6GHz	23.5	5600	εr	48.5	47.4	-2.3	+/-5
						σ [mho/m]	5.77	5.96	3.3	+/-5
1-May	24.0	45	MSL 3-6GHz	23.5	5300	εr	48.9	47.4	-3.0	+/-5
						σ [mho/m]	5.42	5.60	3.2	+/-5
1-May	24.0	45	MSL 3-6GHz	23.5	5500	εr	48.6	47.1	-3.0	+/-5
						σ [mho/m]	5.65	5.84	3.4	+/-5
1-May	24.0	45	MSL 3-6GHz	23.5	5600	εr	48.5	46.9	-3.3	+/-5
						σ [mho/m]	5.77	5.96	3.2	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET65.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*2	Measured	Deviation [%]	Limit [%]*3
22-Apr	24.0	45	MSL 3-6GHz	23.5	5800	εr	46.1	46.1	0.0	+/-6
						σ [mho/m]	6.21	6.23	0.3	+/-6
23-Apr	24.9	33	MSL 3-6GHz	23.9	5800	εr	46.1	46.3	0.3	+/-6
						σ [mho/m]	6.21	6.19	-0.3	+/-6
24-Apr	24.9	38	MSL 3-6GHz	24.2	5200	εr	47.0	47.1	0.3	+/-6
						σ [mho/m]	5.42	5.42	0.0	+/-6
26-Apr	24.9	51	MSL 3-6GHz	24.4	5200	εr	47.0	47.0	0.0	+/-6
						σ [mho/m]	5.42	5.46	0.7	+/-6
26-Apr	24.9	51	MSL 3-6GHz	24.4	5300	εr	46.9	46.9	-0.1	+/-6
						σ [mho/m]	5.55	5.60	0.8	+/-6
27-Apr	24.0	45	MSL 3-6GHz	23.5	5300	εr	46.9	47.5	1.3	+/-6
						σ [mho/m]	5.55	5.56	0.2	+/-6
27-Apr	24.0	45	MSL 3-6GHz	23.5	5500	εr	46.5	47.5	2.1	+/-6
						σ [mho/m]	5.80	5.83	0.5	+/-6
27-Apr	24.0	45	MSL 3-6GHz	23.5	5600	εr	46.4	47.3	2.0	+/-6
						σ [mho/m]	5.94	5.96	0.4	+/-6
30-Apr	24.0	45	MSL 3-6GHz	23.5	5500	εr	46.5	47.5	2.2	+/-6
						σ [mho/m]	5.80	5.77	-0.5	+/-6
30-Apr	24.0	45	MSL 3-6GHz	23.5	5600	εr	46.4	47.4	2.1	+/-6
						σ [mho/m]	5.94	5.96	0.3	+/-6
1-May	24.0	45	MSL 3-6GHz	23.5	5300	εr	46.9	47.4	1.1	+/-6
						σ [mho/m]	5.55	5.60	0.8	+/-6
1-May	24.0	45	MSL 3-6GHz	23.5	5500	εr	46.5	47.1	1.4	+/-6
						σ [mho/m]	5.80	5.84	0.8	+/-6
1-May	24.0	45	MSL 3-6GHz	23.5	5600	εr	46.4	46.9	1.1	+/-6
						σ [mho/m]	5.94	5.96	0.3	+/-6

εr: Relative Permittivity / σ : Coductivity

*2 The target value is the calibrated dipole Body TSL parameters. (D5GHzV2 SN:1070, Measured Body TSL parameters)

*3 The limit is for deviation provided by manufacture.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION						
Date	Frequency [MHz]	SAR 1g [W/kg]				
		Forward Power 100mW Measured	Conversion 1W Calculation	Target 1W *1	Deviation [%]	Limit [%]
22-Apr	5800	7.21	72.10	73.90	-2.4	+/-10
23-Apr	5800	7.29	72.90	73.90	-1.4	+/-10
24-Apr	5200	7.87	78.70	74.11	6.2	+/-10
26-Apr	5200	7.74	77.40	74.11	4.4	+/-10
26-Apr	5300	8.05	80.50	75.60	6.5	+/-10
27-Apr	5300	8.04	80.40	75.60	6.3	+/-10
27-Apr	5500	8.15	81.50	79.20	2.9	+/-10
27-Apr	5600	8.61	86.10	79.90	7.8	+/-10
30-Apr	5500	7.78	77.80	79.20	-1.8	+/-10
30-Apr	5600	8.62	86.20	79.90	7.9	+/-10
1-May	5300	7.81	78.10	75.60	3.3	+/-10
1-May	5500	8.18	81.80	79.90	2.4	+/-10
1-May	5600	8.42	84.20	79.20	6.3	+/-10

*1 The taget value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D5GHzV2 SN:1070)

Daily: MSL5800MHz (W58 Band)

Date/Time: 2013/04/22 10:27:38

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5800 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5800 MHz; σ = 6.226 S/m; ε_r = 46.082; ρ = 1000 kg/m^3

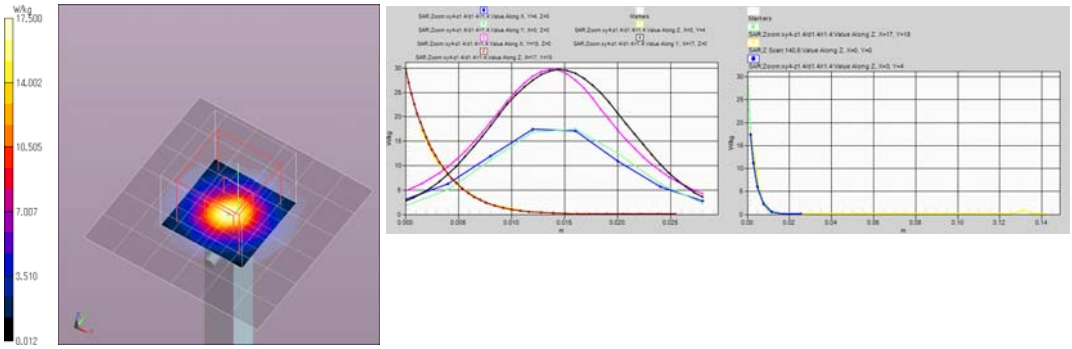
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

-Probe: EX3DV4 - SN3679; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn626; Calibrated: 2013/03/11
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 18.9 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.9 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 17.8 W/kg
Fast SAR(*.Polynomial fit): SAR(1 g) = 6.73 mW/g; SAR(10 g) = 1.81 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.988 V/m; Power Drift = -0.01 dB, Maximum value of SAR (measured) = 17.5 W/kg
Peak SAR (extrapolated) = 29.729 mW/g
SAR(1 g) = 7.21 mW/g; SAR(10 g) = 2.03 mW/g



Remarks: *. Date tested: 2013/04/22; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5800MHz (W58 Band)

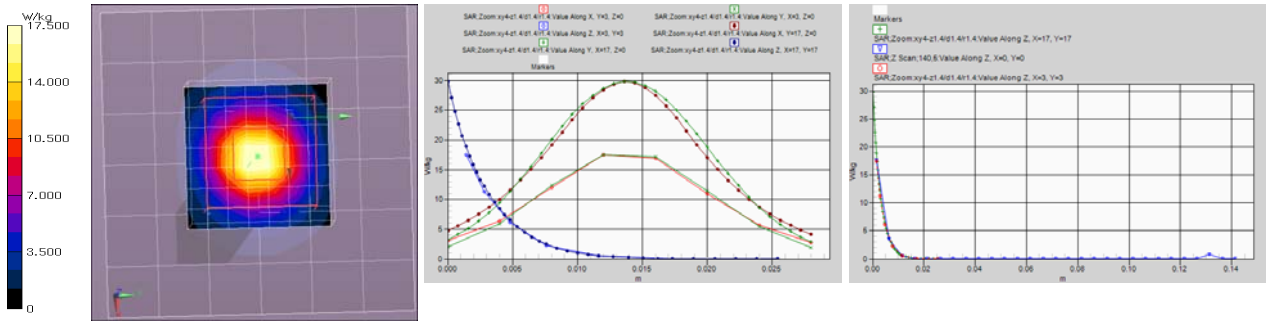
Date/Time: 2013/04/23 8:43:37

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070
Communication System: CW; Frequency: 5800 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used: f = 5800 MHz; σ = 6.194 S/m; ε_r = 46.25; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:
-Probe: EX3DV4 - SN3679; ConvF(3.87, 3.87, 3.87); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn626; Calibrated: 2013/03/11
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm;
Maximum value of SAR (measured) = 19.4 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm;
Maximum value of SAR (interpolated) = 19.4 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm;
Maximum value of SAR (measured) = 17.6 W/kg
Fast SAR: SAR(1 g) = 6.87 mW/g; SAR(10 g) = 1.84 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm;
Reference Value = 66.705 V/m; Power Drift = -0.00 dB, Maximum value of SAR (measured) = 17.5 W/kg
Peak SAR (extrapolated) = 29.834 mW/g
SAR(1 g) = 7.29 mW/g; SAR(10 g) = 2.05 mW/g



Remarks: *. Date tested: 2013/04/23; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*.liquid depth: 131mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.9 deg.C. / 33 %RH,
*.liquid temperature: 22.7(start)/22.8(end)/23.9(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5200MHz (W52 Band)

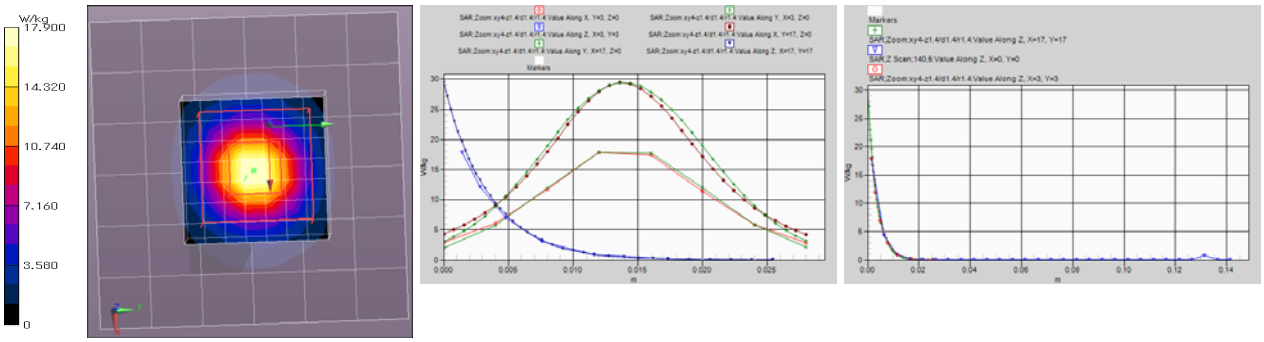
Date/Time: 2013/04/24 8:49:12

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070
Communication System: CW; Frequency: 5200 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used: f = 5200 MHz; σ = 5.419 S/m; ε_r = 47.13; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:
-Probe: EX3DV4 - SN3679; ConvF(4.13, 4.13, 4.13); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn626; Calibrated: 2013/03/11
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm;
Maximum value of SAR (measured) = 19.2 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm;
Maximum value of SAR (interpolated) = 19.4 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 17.7 W/kg
Fast SAR: SAR(1 g) = 7.37 mW/g; SAR(10 g) = 2.01 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.767 V/m; Power Drift = -0.00 dB, Maximum value of SAR (measured) = 17.9 W/kg
Peak SAR (extrapolated) = 29.449 mW/g
SAR(1 g) = 7.87 mW/g; SAR(10 g) = 2.25 mW/g



Remarks: *. Date tested: 2013/04/24; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*.liquid depth: 131mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.9 deg.C. / 38 %RH,
*.liquid temperature: 22.9(start)/22.9(end)/24.2(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5200MHz (W52 Band)

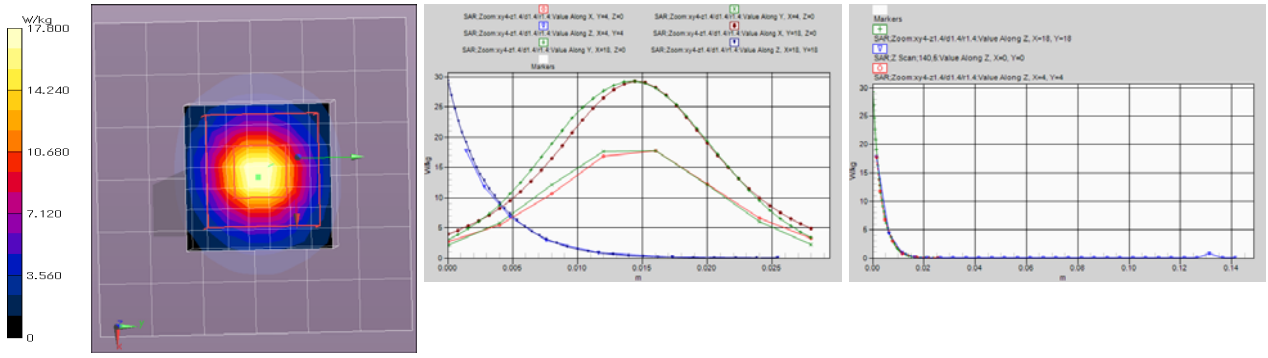
Date/Time: 2013/04/26 8:40:23

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070
Communication System: CW; Frequency: 5200 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used: f = 5200 MHz; σ = 5.459 S/m; ε_r = 46.98; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:
-Probe: EX3DV4 - SN3679; ConvF(4.13, 4.13, 4.13); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm;
Maximum value of SAR (measured) = 19.0 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm;
Maximum value of SAR (interpolated) = 19.2 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm;
Maximum value of SAR (measured) = 17.8 W/kg
Fast SAR (*.Polynomial fit): SAR(1 g) = 7.35 mW/g; SAR(10 g) = 2.03 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm;
Reference Value = 67.639 V/m; Power Drift = 0.04 dB, Maximum value of SAR (measured) = 17.8 W/kg
Peak SAR (extrapolated) = 29.290 mW/g (+1.3% vs. speag-cal.=28.9mW/g)
SAR(1 g) = 7.74 mW/g (+4.5% vs. speag-cal.=7.4mW/g)**; SAR(10 g) = 2.24 mW/g**



Remarks: *. Date tested: 2013/04/26; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.9 deg.C. / 51 %RH,
*.liquid temperature: 23.7(start)/23.6(end)/24.4(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5200MHz (W52 Band)

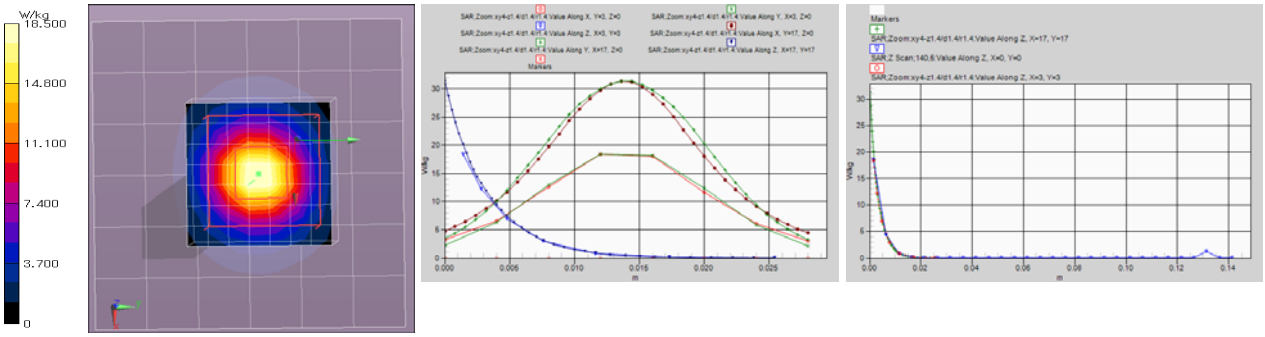
Date/Time: 2013/04/26 9:10:14

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070
Communication System: CW; Frequency: 5300 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used: f = 5300 MHz; σ = 5.597 S/m; ε_r = 46.85; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:
-Probe: EX3DV4 - SN3679; ConvF(3.98, 3.98, 3.98); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 19.4 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm;
Maximum value of SAR (interpolated) = 20.1 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm;
Maximum value of SAR (measured) = 18.6 W/kg
Fast SAR (*.Polynomial fit): SAR(1 g) = 7.63 mW/g; SAR(10 g) = 2.08 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm;
Reference Value = 67.718 V/m; Power Drift = -0.02 dB, Maximum value of SAR (measured) = 18.5 W/kg
Peak SAR (extrapolated) = 31.389 mW/g (+3.3% vs. speag-cal.=30.4mW/g)
SAR(1 g) = 8.05 mW/g (+6.5% vs. speag-cal.=7.56mW/g)**; SAR(10 g) = 2.3 mW/g**



Remarks: *. Date tested: 2013/04/26; Tested by: Hiroshi Naka; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.9 deg.C. / 51 %RH,
*.liquid temperature: 23.6(start)/23.6(end)/24.4(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5300MHz (W53 Band)

Date/Time: 2013/04/27 9:19:59

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5300 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5300 MHz; σ = 5.562 S/m; ε_r = 47.511; ρ = 1000 kg/m^3

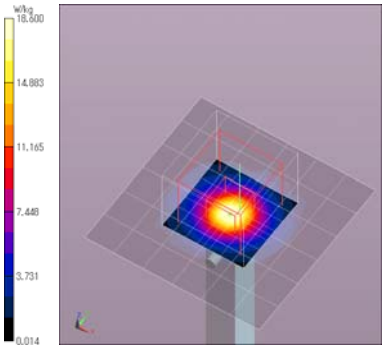
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

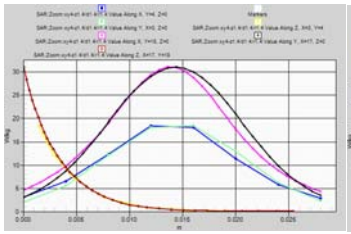
DASY Configuration:

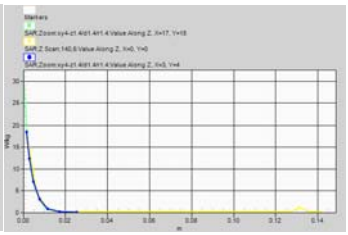
-Probe: EX3DV4 - SN3679; ConvF(3.98, 3.98, 3.98); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 20.3 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.3 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 18.4 W/kg
Fast SAR(*.Polynomial fit):: SAR(1 g) = 7.56 mW/g; SAR(10 g) = 2.05 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.150 V/m; Power Drift = 0.01 dB, Maximum value of SAR (measured) = 18.6 W/kg
Peak SAR (extrapolated) = 31.054 mW/g
SAR(1 g) = 8.04 mW/g; SAR(10 g) = 2.28 mW/g







Remarks: *. Date tested: 2013/04/27; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5500MHz (W55 Band)

Date/Time: 2013/04/27 9:51:41

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5500 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5500 MHz; σ = 5.827 S/m; ε_r = 47.471; ρ = 1000 kg/m^3

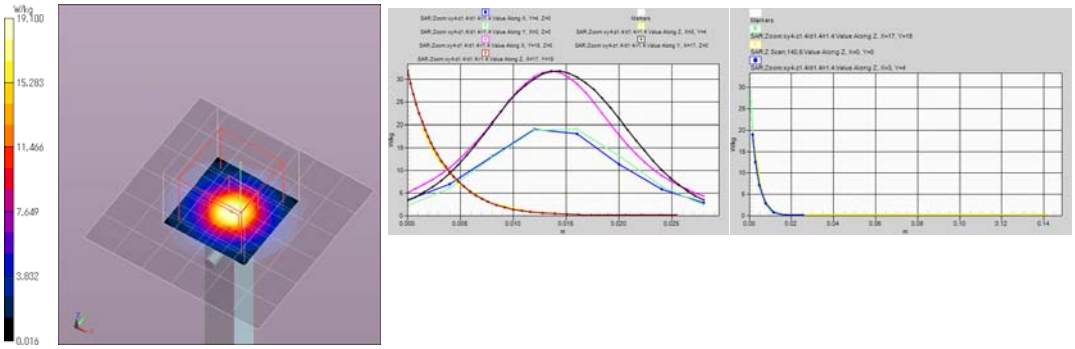
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

-Probe: EX3DV4 - SN3679; ConvF(3.7, 3.7, 3.7); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 20.2 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.5 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 19.2 W/kg
Fast SAR(*.Polynomial fit):: SAR(1 g) = 7.52 mW/g; SAR(10 g) = 2.04 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.527 V/m; Power Drift = -0.00 dB, Maximum value of SAR (measured) = 19.1 W/kg
Peak SAR (extrapolated) = 31.867 mW/g
SAR(1 g) = 8.15 mW/g; SAR(10 g) = 2.31 mW/g



Remarks: *. Date tested: 2013/04/27; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5600MHz (W56 Band)

Date/Time: 2013/04/27 10:23:56

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5600 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5600 MHz; σ = 5.962 S/m; ε_r = 47.333; ρ = 1000 kg/m^3

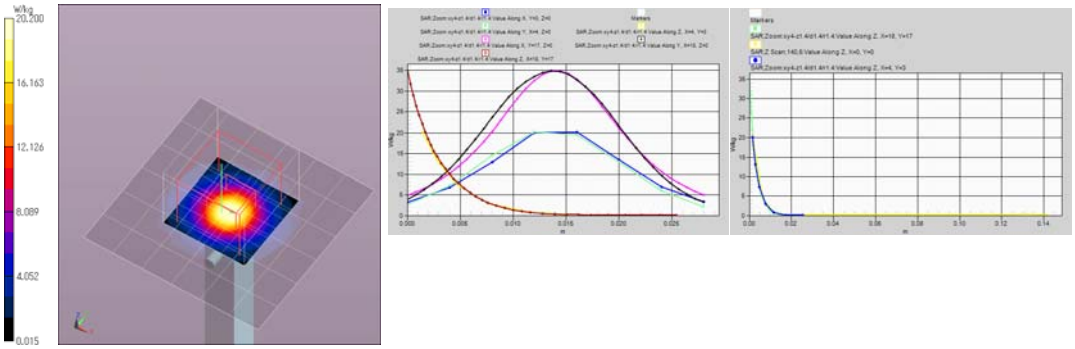
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

-Probe: EX3DV4 - SN3679; ConvF(3.61, 3.61, 3.61); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 22.1 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 22.1 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 20.5 W/kg
Fast SAR(*.Polynomial fit):: SAR(1 g) = 8.03 mW/g; SAR(10 g) = 2.15 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.841 V/m; Power Drift = 0.06 dB, Maximum value of SAR (measured) = 20.2 W/kg
Peak SAR (extrapolated) = 34.887 mW/g
SAR(1 g) = 8.61 mW/g; SAR(10 g) = 2.42 mW/g



Remarks: *. Date tested: 2013/04/27; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5500MHz (W56 Band)

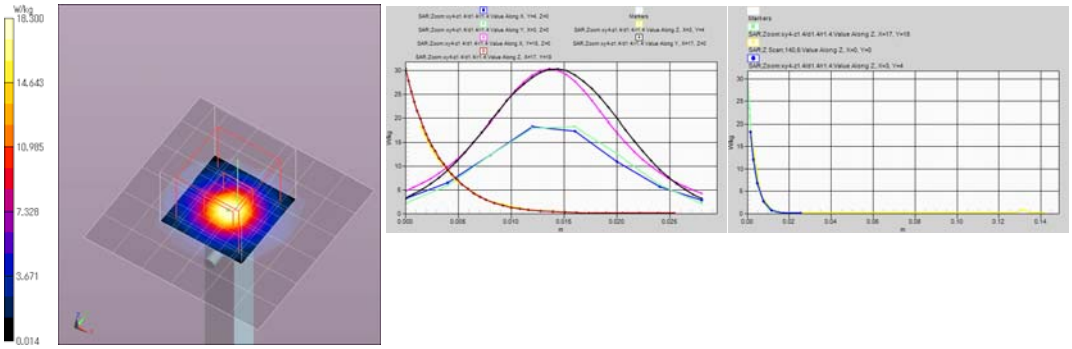
Date/Time: 2013/04/30 9:27:47

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070
Communication System: CW; Frequency: 5500 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used: f = 5500 MHz; σ = 5.77 S/m; ε_r = 47.502; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:
-Probe: EX3DV4 - SN3679; ConvF(3.7, 3.7, 3.7); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 19.5 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.7 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 18.6 W/kg
Fast SAR(*.Polynomial fit): SAR(1 g) = 7.22 mW/g; SAR(10 g) = 1.96 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.656 V/m; Power Drift = -0.05 dB, Maximum value of SAR (measured) = 18.3 W/kg
Peak SAR (extrapolated) = 30.282 mW/g
SAR(1 g) = 7.78 mW/g; SAR(10 g) = 2.21 mW/g



Remarks: *. Date tested: 2013/04/30; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5600MHz (W56 Band)

Date/Time: 2013/04/30 8:59:41

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5600 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5600 MHz; σ = 5.96 S/m; ε_r = 47.386; ρ = 1000 kg/m^3

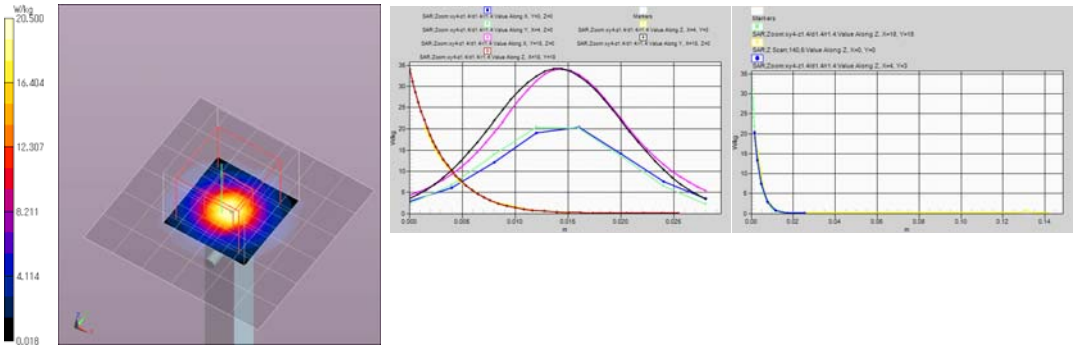
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

-Probe: EX3DV4 - SN3679; ConvF(3.61, 3.61, 3.61); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 21.8 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 22.0 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 20.4 W/kg
Fast SAR(*.Polynomial fit): SAR(1 g) = 8.02 mW/g; SAR(10 g) = 2.15 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.153 V/m; Power Drift = 0.00 dB, Maximum value of SAR (measured) = 20.5 W/kg
Peak SAR (extrapolated) = 34.104 mW/g
SAR(1 g) = 8.62 mW/g; SAR(10 g) = 2.43 mW/g



Remarks: *. Date tested: 2013/04/30; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5300MHz (W53 Band)

Date/Time: 2013/05/01 10:32:35

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5300 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5300 MHz; σ = 5.595 S/m; ε_r = 47.439; ρ = 1000 kg/m^3

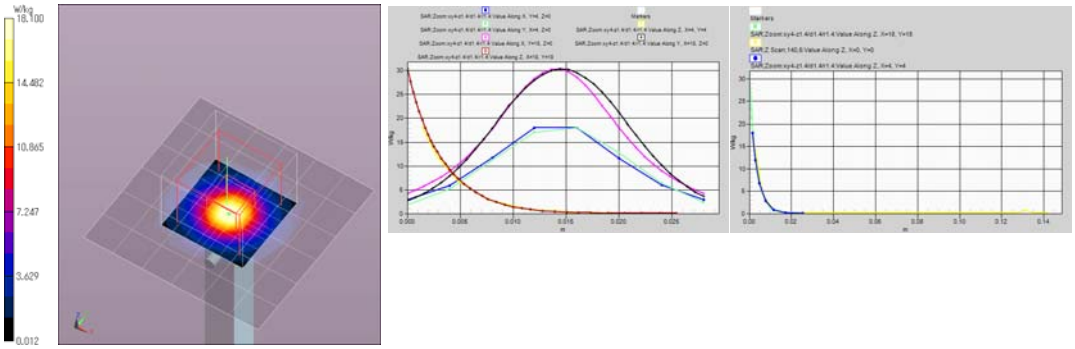
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

-Probe: EX3DV4 - SN3679; ConvF(3.98, 3.98, 3.98); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 20.0 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.0 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 18.0 W/kg
Fast SAR(*.Polynomial fit): SAR(1 g) = 7.42 mW/g; SAR(10 g) = 2.01 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.383 V/m; Power Drift = -0.02 dB, Maximum value of SAR (measured) = 18.1 W/kg
Peak SAR (extrapolated) = 30.328 mW/g
SAR(1 g) = 7.81 mW/g; SAR(10 g) = 2.21 mW/g



Remarks: *. Date tested: 2013/05/01; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5500MHz (W56 Band)

Date/Time: 2013/05/01 10:59:52

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5500 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5500 MHz; σ = 5.844 S/m; ε_r = 47.14; ρ = 1000 kg/m^3

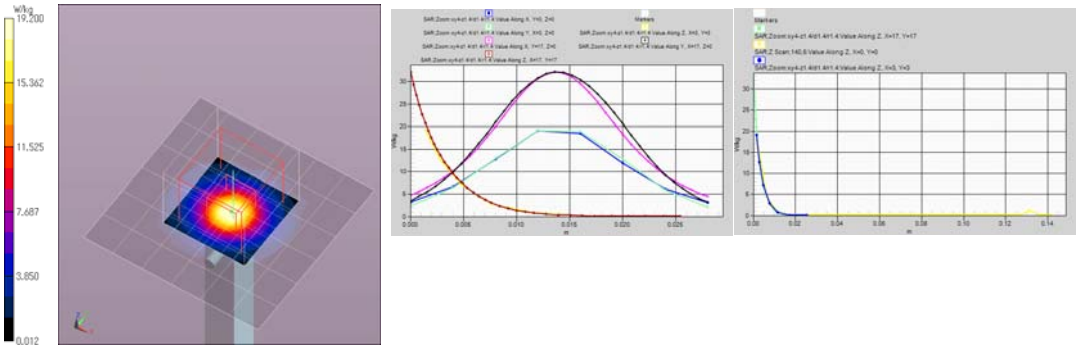
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

-Probe: EX3DV4 - SN3679; ConvF(3.7, 3.7, 3.7); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 21.0 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 21.0 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 19.0 W/kg
Fast SAR(*.Polynomial fit): SAR(1 g) = 7.66 mW/g; SAR(10 g) = 2.07 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.726 V/m; Power Drift = -0.06 dB, Maximum value of SAR (measured) = 19.2 W/kg
Peak SAR (extrapolated) = 32.161 mW/g
SAR(1 g) = 8.18 mW/g; SAR(10 g) = 2.31 mW/g



Remarks: *. Date tested: 2013/05/01; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

Daily: MSL5600MHz (W56 Band)

Date/Time: 2013/05/01 11:27:38

DUT: Dipole(5GHz); Type: D5GHzV2; Serial: 1070

Communication System: CW; Frequency: 5600 MHz; Crest Factor: 1.0

Medium: MSL5800; Medium parameters used: f = 5600 MHz; σ = 5.956 S/m; ε_r = 46.91; ρ = 1000 kg/m^3

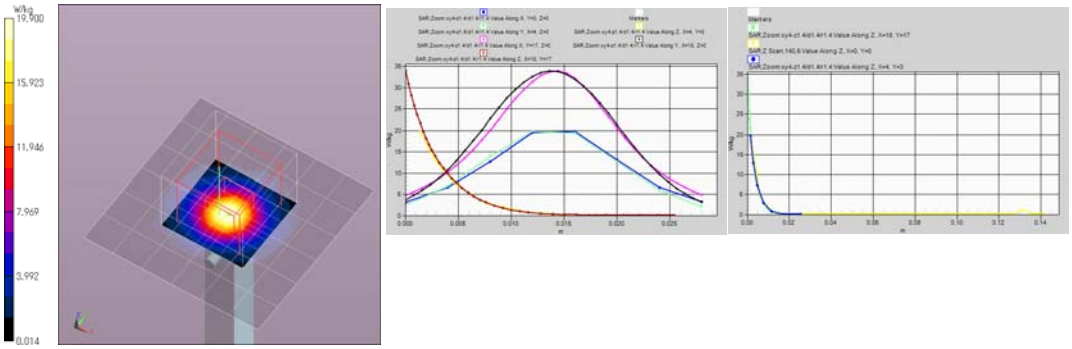
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

-Probe: EX3DV4 - SN3679; ConvF(3.61, 3.61, 3.61); Calibrated: 2012/06/21;
-Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 25.0, 141.0
-Electronics: DAE4 Sn518; Calibrated: 2012/10/17
-Phantom: ELI v4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
-DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

Area:60x60,10 (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 21.7 W/kg
Area:60x60,10 (61x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 21.7 W/kg
Z Scan;140,5 (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Fast SAR(*.Polynomial fit): SAR(1 g) = 7.89 mW/g; SAR(10 g) = 2.11 mW/g

Zoom:xy4-z1.4/d1.4/r1.4 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.203 V/m; Power Drift = -0.00 dB, Maximum value of SAR (measured) = 19.9 W/kg
Peak SAR (extrapolated) = 33.919 mW/g
SAR(1 g) = 8.42 mW/g; SAR(10 g) = 2.37 mW/g



Remarks: *. Date tested: 2013/05/01; Tested by: Tomochika Sato; Tested place:No.7 shielded room,
*.liquid depth: 129mm; Position: distance of dipole to phantom: 8mm (10mm to liquid); ambient: 24.0 deg.C. / 45 %RH,
*.liquid temperature: 23.5(start)/23.5(end)/23.5(in check) deg.C.; *.White cubic: zoom scan area, Red cubic: big=SAR(10g)/small=SAR(1g)

3. System Validation Dipole (D2450V2,S/N:822)

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 Shonan (PTT)

Certificate No: D2450V2-822_Jan13

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 822

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: January 08, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 8, 2013

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Certificate No: D2450V2-822_Jan13 Page 1 of 8

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.5 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.93 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.4 W/kg ± 16.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.6 Ω + 3.5 jΩ
Return Loss	- 26.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.4 Ω + 5.2 jΩ
Return Loss	- 25.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 11, 2008

DASY5 Validation Report for Head TSL

Date: 08.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

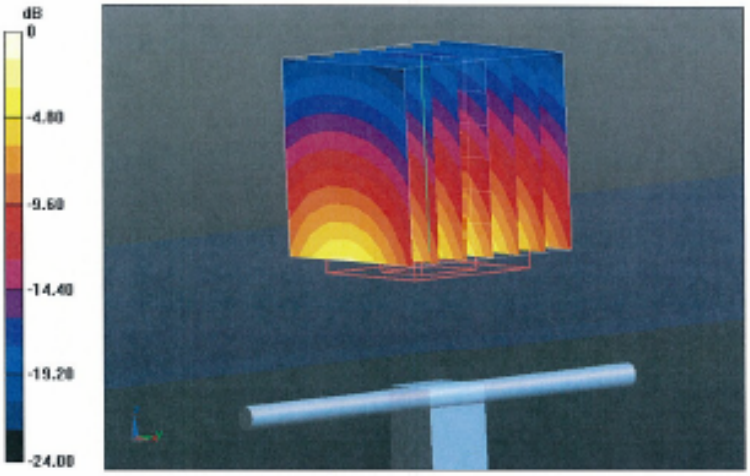
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 822

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

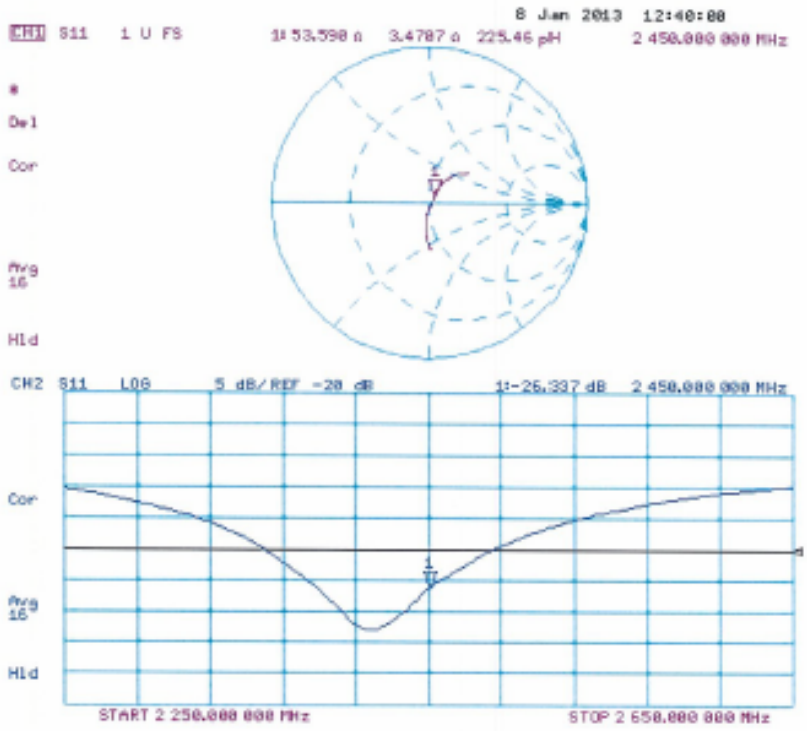
- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.521 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.23 W/kg
Maximum value of SAR (measured) = 17.0 W/kg



0 dB = 17.0 W/kg = 12.30 dBW/kg

Impedance Measurement Plot for Head TSL



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Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

DASY5 Validation Report for Body TSL

Date: 08.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 822

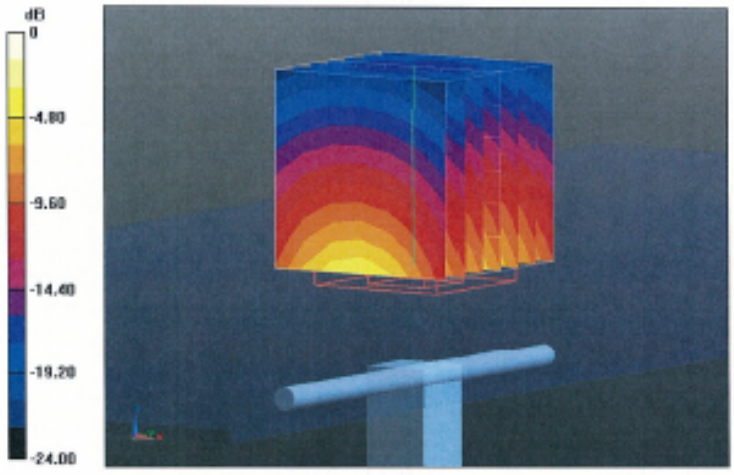
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.01 S/m; ε_r = 50.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

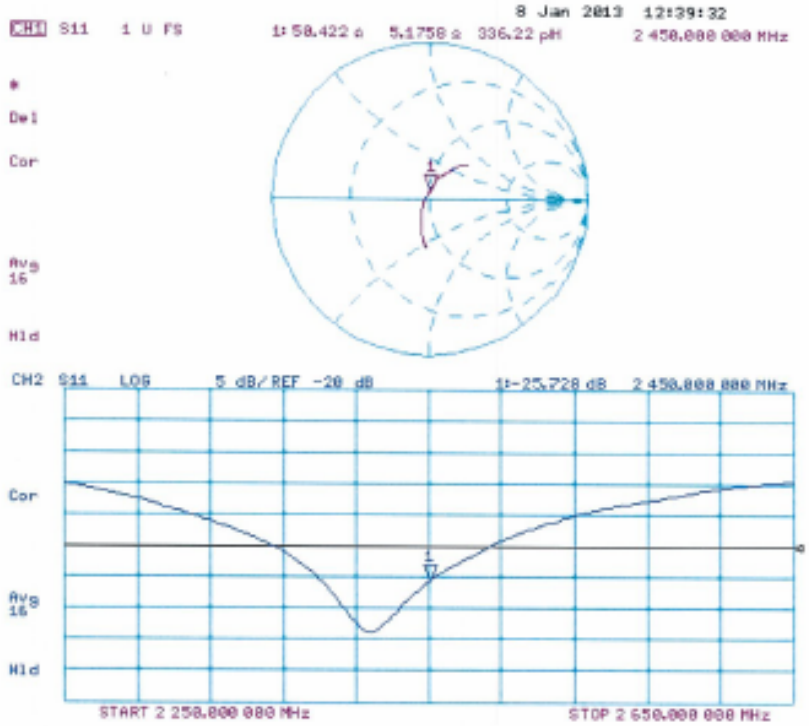
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.977 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.93 W/kg
Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 16.7 W/kg = 12.23 dBW/kg

Impedance Measurement Plot for Body TSL



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Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

4. System Validation Dipole (D5GHzV2,S/N:1070)

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

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Accreditation No.: SCS 108

Client **UL Japan Shonan (PTT)**

Certificate No: **D5GHzV2-1070_Mar13**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1070
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	March 14, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe EX3DV4	SN: 3503	28-Dec-12 (No. EX3-3503_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (In house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (In house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (In house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 14, 2013

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Certificate No: D5GHzV2-1070_Mar13 Page 1 of 20

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) 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:

c) 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.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.5 W/kg ± 19.5 % (k=2)**

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Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
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Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.3 ± 6 %	4.62 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.9 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.0 ± 6 %	4.80 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 19.5 % (k=2)**

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.9 ± 6 %	4.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.6 ± 6 %	5.11 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.2 W/kg ± 19.5 % (k=2)**

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Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.42 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.9 ± 6 %	5.55 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.56 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 W/kg ± 19.5 % (k=2)**

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Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.5 ± 6 %	5.80 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.92 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.99 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.0 W/kg ± 19.5 % (k=2)**

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.1 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.39 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.3 W/kg ± 19.5 % (k=2)**

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Telephone: +81 596 24 8999
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Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.7 Ω - 12.5 jΩ
Return Loss	- 18.2 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	51.9 Ω - 6.5 jΩ
Return Loss	- 23.6 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	49.2 Ω - 7.4 jΩ
Return Loss	- 22.5 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	55.6 Ω - 9.9 jΩ
Return Loss	- 19.4 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	53.9 Ω - 4.8 jΩ
Return Loss	- 24.6 dB

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.8 Ω - 12.4 jΩ
Return Loss	- 18.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	51.3 Ω - 5.0 jΩ
Return Loss	- 25.8 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	49.3 Ω - 5.6 jΩ
Return Loss	- 24.9 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	54.5 Ω - 8.2 jΩ
Return Loss	- 21.0 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	54.5 Ω - 2.5 jΩ
Return Loss	- 26.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
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	September 26, 2008

DASY5 Validation Report for Head TSL

Date: 13.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1070

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.52 S/m; ε_r = 34.4; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 4.62 S/m; ε_r = 34.3; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 4.8 S/m; ε_r = 34; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 4.91 S/m; ε_r = 33.9; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 5.11 S/m; ε_r = 33.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(5.1, 5.1, 5.1); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.76, 4.76, 4.76); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.581 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

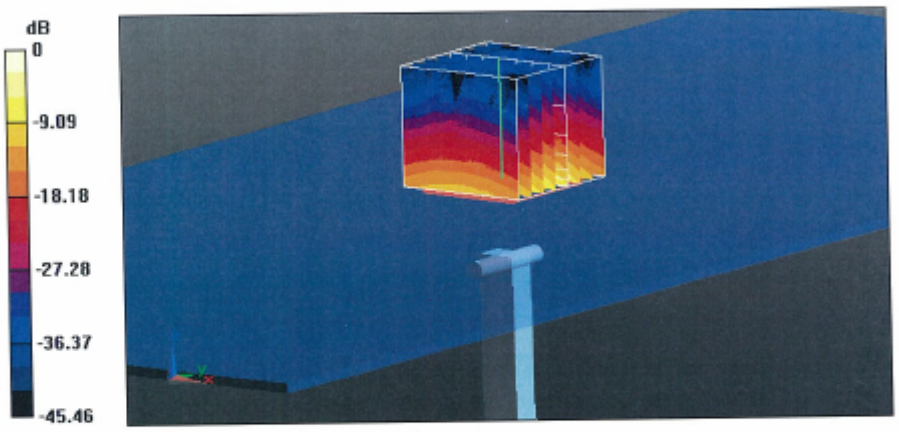
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.313 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 8.27 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.127 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 33.9 W/kg
SAR(1 g) = 8.52 W/kg; SAR(10 g) = 2.42 W/kg
Maximum value of SAR (measured) = 20.9 W/kg

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

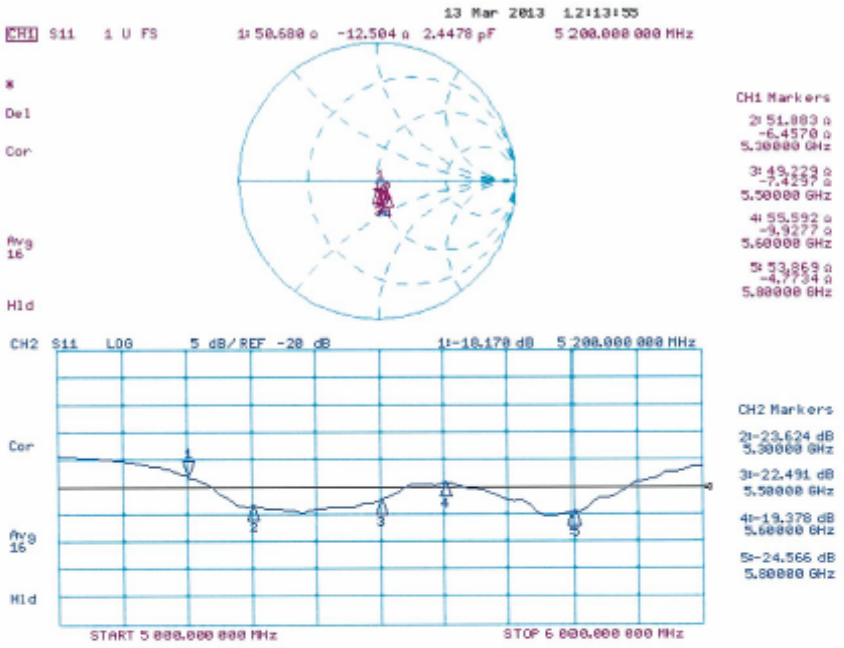
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.687 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 33.4 W/kg
SAR(1 g) = 8.38 W/kg; SAR(10 g) = 2.39 W/kg
Maximum value of SAR (measured) = 20.5 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.292 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 32.8 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1070

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.42 S/m; ε_r = 47; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 5.55 S/m; ε_r = 46.9; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 5.8 S/m; ε_r = 46.5; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 5.94 S/m; ε_r = 46.4; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 6.21 S/m; ε_r = 46.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.67, 4.67, 4.67); Calibrated: 28.12.2012, ConvF(4.43, 4.43, 4.43); Calibrated: 28.12.2012, ConvF(4.22, 4.22, 4.22); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.030 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 7.41 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.5 W/kg

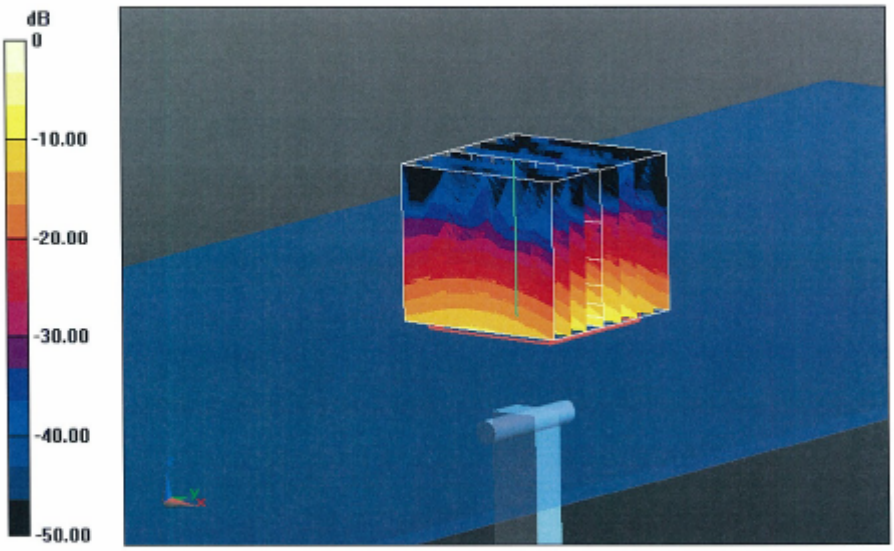
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.855 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 30.4 W/kg
SAR(1 g) = 7.56 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 18.0 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.871 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 34.0 W/kg
SAR(1 g) = 7.92 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

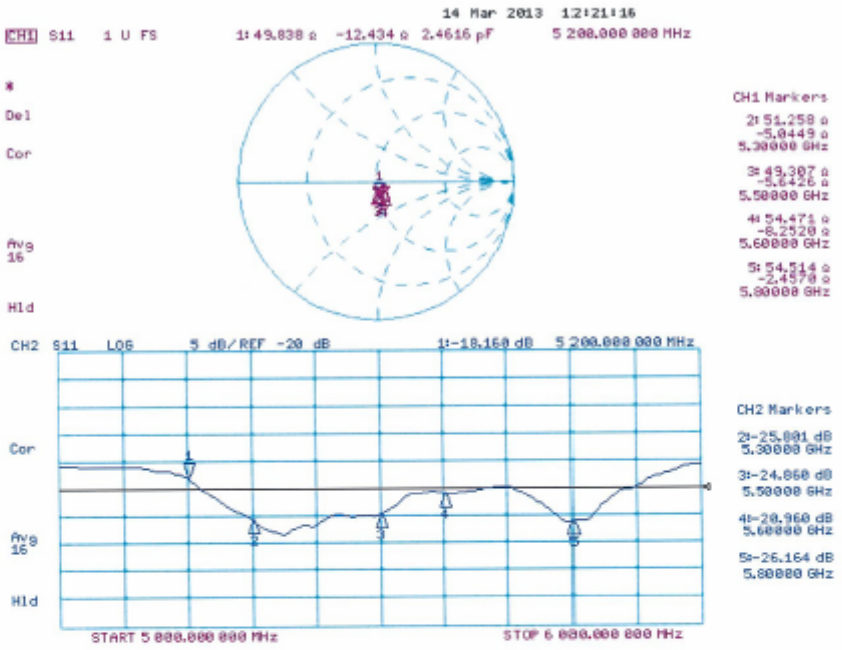
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.618 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 35.1 W/kg
SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.394 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 34.3 W/kg
SAR(1 g) = 7.39 W/kg; SAR(10 g) = 2.05 W/kg
Maximum value of SAR (measured) = 18.5 W/kg



0 dB = 18.5 W/kg = 12.67 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix B: Additional Measurements

Upon customer request, additional antenna parameter measurements were done using customer spacers, for Head and Body conditions. Results are summarized on the following pages.

Antenna Parameters with Head TSL at 5200 MHz

New spacer	50.7 Ω - 12.5 jΩ	- 18.2 dB
UL spacer #1	51.0 Ω - 12.2 jΩ	- 18.4 dB
UL spacer #2	51.2 Ω - 12.0 jΩ	- 18.6 dB

Antenna Parameters with Head TSL at 5300 MHz

New spacer	51.9 Ω - 6.5 jΩ	- 23.6 dB
UL spacer #1	51.9 Ω - 6.3 jΩ	- 23.8 dB
UL spacer #2	52.0 Ω - 6.0 jΩ	- 24.1 dB

Antenna Parameters with Head TSL at 5500 MHz

New spacer	49.2 Ω - 7.4 jΩ	- 22.5 dB
UL spacer #1	49.6 Ω - 7.6 jΩ	- 22.4 dB
UL spacer #2	50.0 Ω - 7.0 jΩ	- 23.1 dB

Antenna Parameters with Head TSL at 5600 MHz

New spacer	55.6 Ω - 9.9 jΩ	- 19.4 dB
UL spacer #1	55.7 Ω - 9.2 jΩ	- 19.8 dB
UL spacer #2	55.6 Ω - 8.8 jΩ	- 20.1 dB

Antenna Parameters with Head TSL at 5800 MHz

New spacer	53.9 Ω - 4.8 jΩ	- 24.6 dB
UL spacer #1	54.2 Ω - 4.7 jΩ	- 24.4 dB
UL spacer #2	54.6 Ω - 3.9 jΩ	- 24.8 dB

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

Antenna Parameters with Body TSL at 5200 MHz

New spacer	49.8 Ω - 12.4 jΩ	- 18.2 dB
UL spacer #1	49.9 Ω - 12.4 jΩ	- 18.2 dB
UL spacer #2	50.1 Ω - 12.3 jΩ	- 18.3 dB

Antenna Parameters with Body TSL at 5300 MHz

New spacer	51.3 Ω - 5.0 jΩ	- 25.8 dB
UL spacer #1	51.4 Ω - 5.0 jΩ	- 25.8 dB
UL spacer #2	51.5 Ω - 4.8 jΩ	- 26.2 dB

Antenna Parameters with Body TSL at 5500 MHz

New spacer	49.3 Ω - 5.6 jΩ	- 24.9 dB
UL spacer #1	49.2 Ω - 5.6 jΩ	- 24.9 dB
UL spacer #2	49.5 Ω - 5.4 jΩ	- 25.2 dB

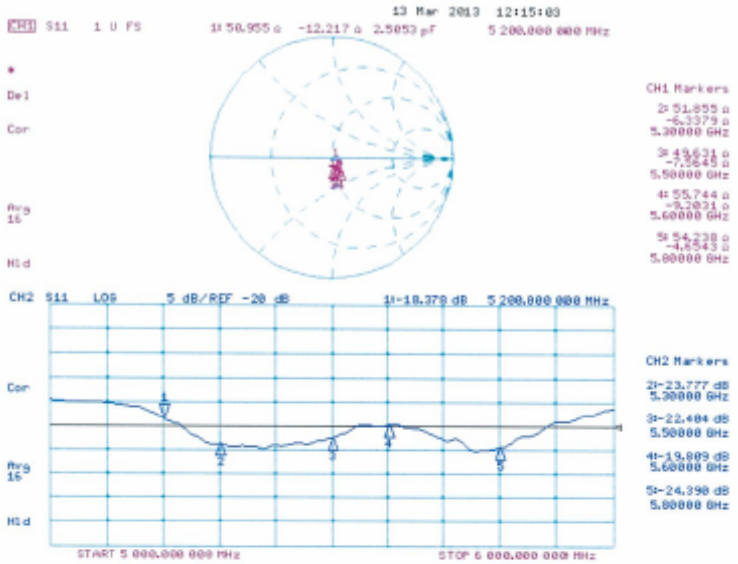
Antenna Parameters with Body TSL at 5600 MHz

New spacer	54.5 Ω - 8.2 jΩ	- 21.0 dB
UL spacer #1	54.7 Ω - 8.2 jΩ	- 20.9 dB
UL spacer #2	54.8 Ω - 7.8 jΩ	- 21.2 dB

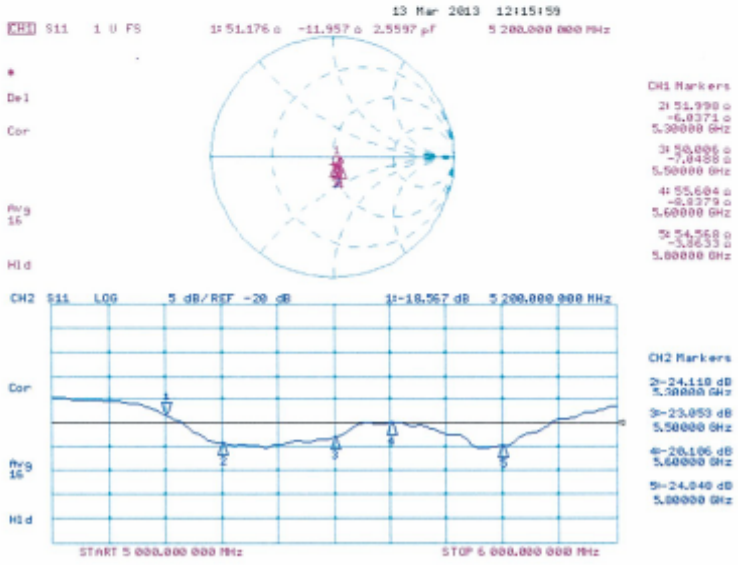
Antenna Parameters with Body TSL at 5800 MHz

New spacer	54.5 Ω - 2.5 jΩ	- 26.2 dB
UL spacer #1	54.4 Ω - 2.2 jΩ	- 26.5 dB
UL spacer #2	54.8 Ω - 1.8 jΩ	- 26.2 dB

Impedance Measurement Plot for Head TSL (UL Spacer #1)

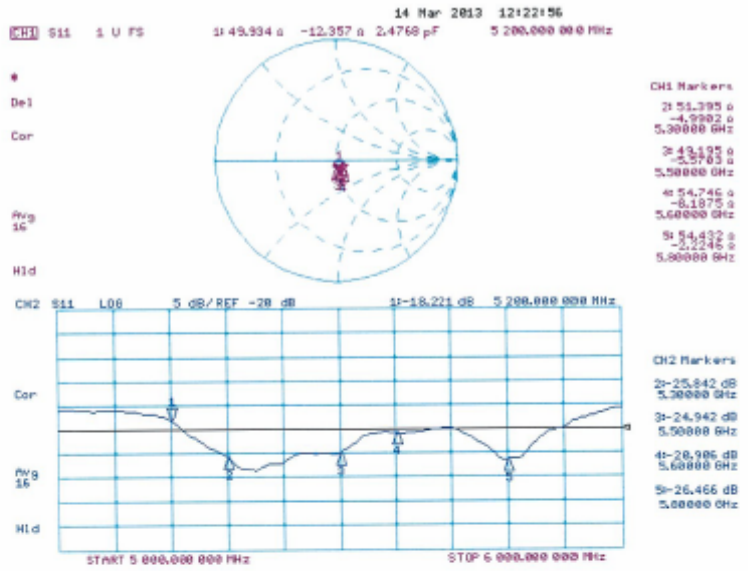


Impedance Measurement Plot for Head TSL (UL Spacer #2)

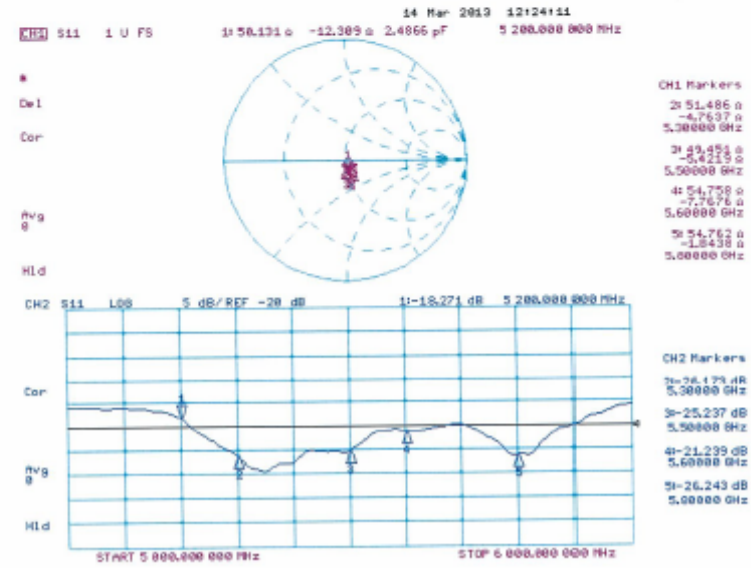


UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

Impedance Measurement Plot for Body TSL (UL Spacer #1)



Impedance Measurement Plot for Body TSL (UL Spacer #2)



UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
Facsimile: +81 596 24 8124

5. Validation uncertainty

Daily check uncertainty

Uncertainty of system daily check (~6GHz) (Body liquid, 2.4-6GHz, e', σ: ≤5%) (v06)	1g SAR	10g SAR
Combined measurement uncertainty of the measurement system (k=1)	± 12.7 %	± 12.4 %
Expanded uncertainty (k=2)	± 25.4 %	± 24.8 %

	Error Description	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
A	**Measurement System** (DASY5)						(std. uncertainty)	(std. uncertainty)	
1	Probe Calibration Error (2.45,5.2,5.3,5.5,5.6,5.8GHz±100MHz)	±6.55 %	Normal	1	1	1	±6.55 %	±6.55 %	∞
2	Axial isotropy	±4.7 %	Rectangular	√3	0.7	0.7	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy (*flat phantom, <5°)	±9.6 %	Rectangular	√3	0.7	0.7	±3.9 %	±3.9 %	∞
4	Boundary effects	±4.8 %	Rectangular	√3	1	1	±2.8 %	±2.8 %	∞
5	Probe linearity	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
6	Probe modulation response (CW)	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
7	System detection limit	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
8	Response Time Error (<5ms/100ms wait)	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
9	Integration Time Error (CW)	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
10	System readout electronics (DAE)	±0.3 %	Normal	1	1	1	±0.3 %	±0.3 %	∞
11	RF ambient conditions-noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	RF ambient conditions-reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
13	Probe positioner mechanical tolerance	±3.3 %	Rectangular	√3	1	1	±1.9 %	±1.9 %	∞
14	Probe positioning with respect to phantom shell	±6.7 %	Rectangular	√3	1	1	±3.9 %	±3.9 %	∞
15	Max.SAR evaluation	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
B	**Test Sample Related**								
16	Deviation of the experimental source	±5.5 %	Normal	1	1	1	±5.5 %	±5.5 %	∞
17	Dipole to liquid distance (10mm±0.2mm,<2deg.)	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2 %	∞
18	Drift of output power (measured, <0.2dB)	±2.5 %	Rectangular	√3	1	1	±1.4 %	±1.4 %	∞
C	**Phantom and Setup**								
19	Phantom uncertainty	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2%	∞
20	Liquid conductivity (target) (≤5%)	±5.0 %	Rectangular	√3	0.64	0.43	±1.8 %	±1.2 %	∞
21	Liquid conductivity (meas.)	±3.0 %	Normal	1	0.64	0.43	±1.9 %	±1.3 %	∞
22	Liquid permittivity (target) (≤5%)	±5.0 %	Rectangular	√3	0.6	0.49	±1.7 %	±1.4 %	∞
23	Liquid permittivity (meas.)	±3.0 %	Normal	1	0.6	0.49	±1.8 %	±1.5 %	∞
24	Liquid Conductivity-temp.uncertainty (≤2deg.C.)	±5.2 %	Rectangular	√3	0.78	0.71	±2.3 %	±2.1 %	∞
25	Liquid Permittivity-temp.uncertainty (≤2deg.C.)	±0.8 %	Rectangular	√3	0.23	0.26	±0.1 %	±0.1 %	∞
	Combined Standard Uncertainty						**±12.7** %	**±12.4** %	
	Expanded Uncertainty (k=2)						**±25.4** %	**±24.8** %	

*. This measurement uncertainty budget is suggested by IEEE 1528, IEC 62209-2 and determined by Schmid & Partner Engineering AG (DASY5 Uncertainty Budget).