APPENDIX 2: SAR Measurement data

Appendix 2-1: Evaluation procedure

The SAR evaluation was performed with the following procedure:

Step 1: Measurement of the E-field at a fixed location above the central position of flat phantom was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the antenna of EUT and suitable horizontal grid spacing of EUT. Based on these data, the area of the maximum absorption was determined by splines interpolation.

Step 3: Around this point found in the Step 2 (area scan), a volume of 30mm(X axis)×30mm(Y axis)×30mm(Z axis) was assessed by measuring 7×7×7 points under 3GHz and a volume of 28mm(X axis)×28mm(Y axis)×22.5mm (Z axis) was assessed by measuring 8×8×6(ratio step method (*1)) points for 3-6GHz frequency band.
And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated.
On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

(1) The data at the surface were extrapolated, since the center of the dipoles is 1mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 2mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

(2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x, y and z-directions) [4], [5]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10×10×10) were interpolated to calculate the average.

(3) All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the E-field at the same location as in Step 1 for the assessment of the power drift.

Step 5: Repeat Step 1-Step 4 with other condition or/and setup of EUT.

***1. Ratio step method parameters used;**
The first measurement point: 2mm from the phantom surface, the initial grid separation: 2mm, subsequent graded grid ratio: 1.5
These parameters comply with the requirement of the KDB 865664.
In the section of SAR Scan Procedures-Zoom Scan, in KDB 865664(October 2006 revised, publication date: April 16, 2007): SAR Measurement Requirements for 3-6GHz, the graded grids requirement is as follows;
"When graded grids are used (z), the first measurement point should be within 3mm of the phantom surface for measurements below 4.5GHz and within 2mm at or above 4.5GHz. The initial grid separation, closest to the phantom, should be ≤ 2.0mm. A subsequent graded ration of 1.5 is recommended and less than 2.0 is required. "

Appendix 2-2: Measurement data (2.4GHz band)

Step 1: Contact side with the patient (Worst RF exposure condition for the patient)

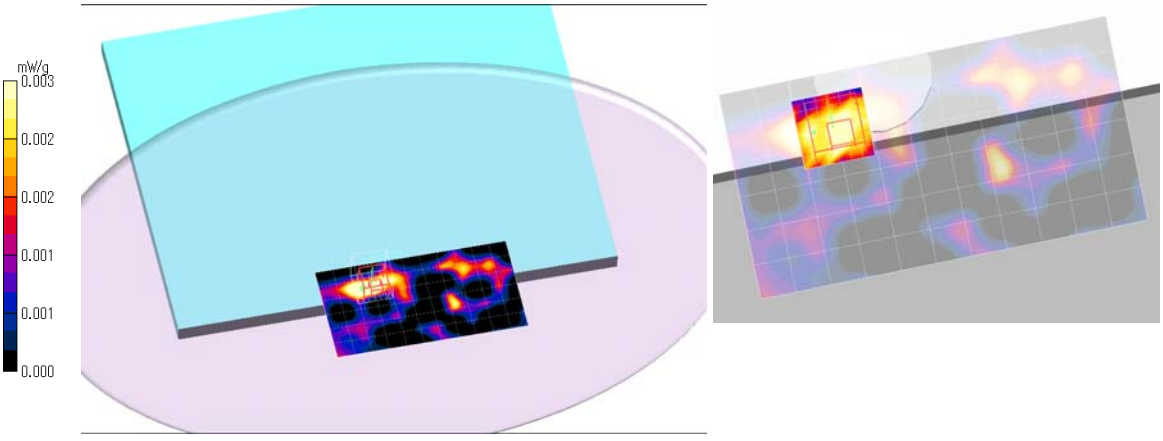
Step 1-1: Front-touch (without accessories (ANTI-SCATTER GRID and Handle Unit))

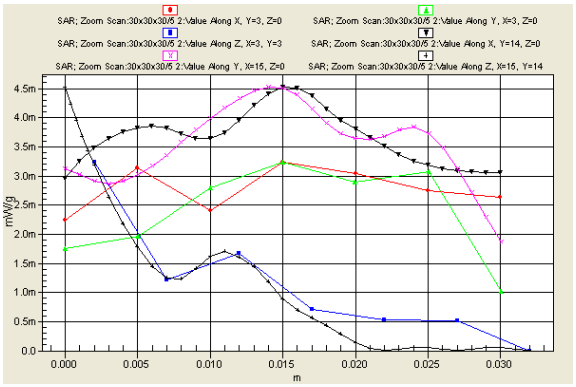
EUT: Digital Radiography with WLAN module; Type: CXDI-80C Wireless (WM5A2); Serial: 11DR-099 (WLAN module: DE2-12)
Communication System: 802.11b(1Mbps, DSSS); Frequency: 2437 MHz; Crest Factor: 1.0
Medium: M2450; Medium parameters used(23.9deg.C): f = 2450 MHz; σ = 1.92 S/m; ε_r = 50.5; ρ = 1000 kg/m^3

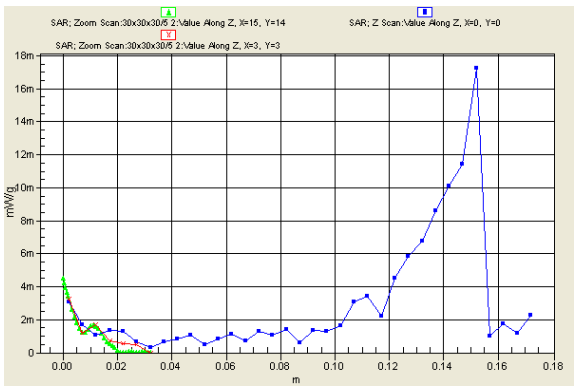
DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(8.05, 8.05, 8.05); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

#1,M137,frt(patient)&d0,m2437(6ch),11b(1m)/
Area Scan:165x90/15 (12x7x1): Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.003 mW/g
Area Scan:165x90/15 (111x61x1): Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (interpolated) = 0.005 mW/g
Z Scan (1x1x35): Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 0.017 mW/g

Zoom Scan:30x30x30/5 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 0.775 V/m; Power Drift = 0.101 dB, Maximum value of SAR (measured) = 0.017 mW/g
Peak SAR (extrapolated) = 0.005 W/kg
SAR(1 g) = 0.0023 mW/g (Worst for 2.4GHz band); SAR(10 g) = 0.00134 mW/g







Additional information:
*.position: the distance of EUT to phantom: 0mm (2mm to liquid), liquid depth: 158mm
*.ambient: 25 deg.C / 50 %RH; .liquid temperature: (before) 23.6 deg.C. /(after) 23.6 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 24, 2011

Appendix 2-2: Measurement data (2.4GHz band)
Step 1: Contact side with the patient (Worst RF exposure condition for the patient)

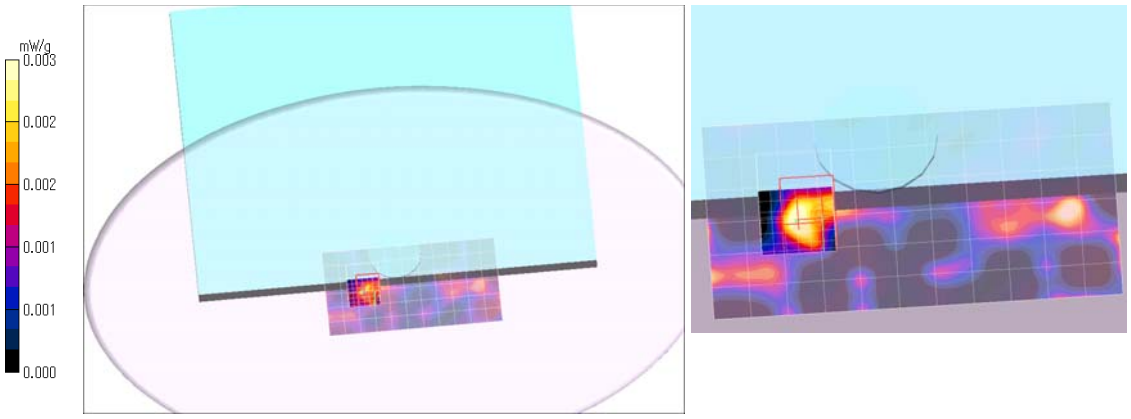
Step 1-2: Front-touch (with accessories (ANTI-SCATTER GRID and Handle Unit))

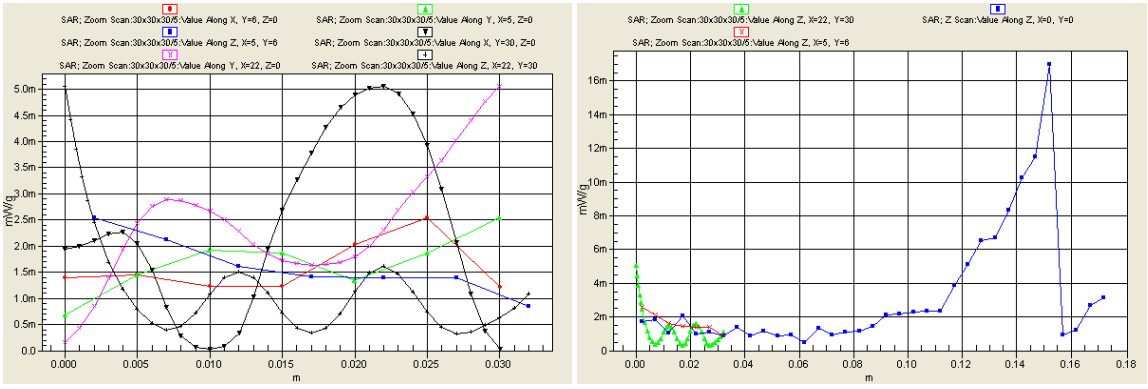
EUT: Digital Radiography with WLAN module; Type: CXDI-80C Wireless (WM5A2); Serial: 11DR-099 (WLAN module: DE2-12)
Communication System: 802.11b(1Mbps, DSSS); Frequency: 2437 MHz; Crest Factor: 1.0
Medium: M2450; Medium parameters used(23.9deg.C): f = 2450 MHz; σ = 1.92 S/m; ε_r = 50.5; ρ = 1000 kg/m^3

DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(8.05, 8.05, 8.05); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

#1,M137,frt(patient)&d0&handle,m2437(6ch),11b(1m)/
Area Scan:165x90/15 (12x7x1): Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.002 mW/g
Area Scan2:165x90/15 (111x61x1): Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (interpolated) = 0.004 mW/g
Z Scan (1x1x35): Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 0.017 mW/g

Zoom Scan:30x30x30/5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 0.745 V/m; Power Drift = 0.20 dB, Maximum value of SAR (measured) = 0.003 mW/g
Peak SAR (extrapolated) = 0.005 W/kg
SAR(1 g) = 0.00164 mW/g; SAR(10 g) = 0.000938 mW/g





Additional information:
*.position: the distance of EUT to phantom: 0mm (2mm to liquid), liquid depth: 158mm
*.ambient: 25 deg.C / 50 %RH; .liquid temperature: (before) 23.6 deg.C. /(after) 23.6 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 24, 2011

Appendix 2-3: Measurement data (5180-5240MHz/W52 band)

Step 1: Contact side with the patient (Worst RF exposure condition for the patient)

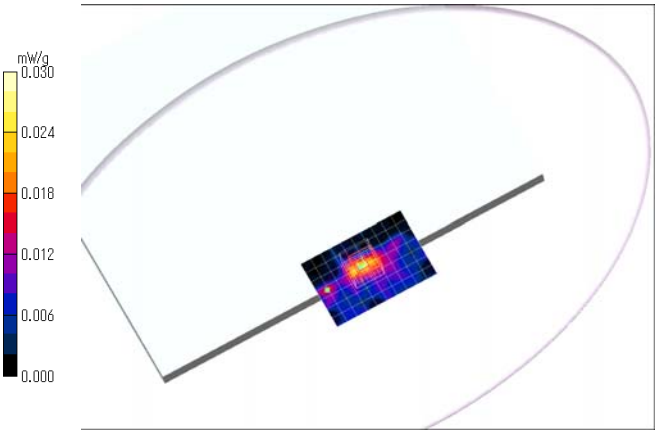
Step 1-1: Front-touch (without accessories (ANTI-SCATTER GRID and Handle Unit))

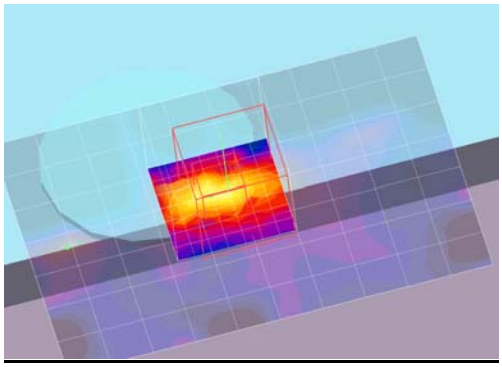
EUT: Digital Radiography with WLAN module; Type: CXDI-80C Wireless (WM5A2); Serial: 11DR-099 (WLAN module: DE2-12)
Communication System: 802.11a(6Mbps, OFDM); Frequency: 5180 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used(24.3deg.C): f = 5180 MHz; σ = 5.4 S/m; ε_r = 48.2; ρ = 1000 kg/m^3

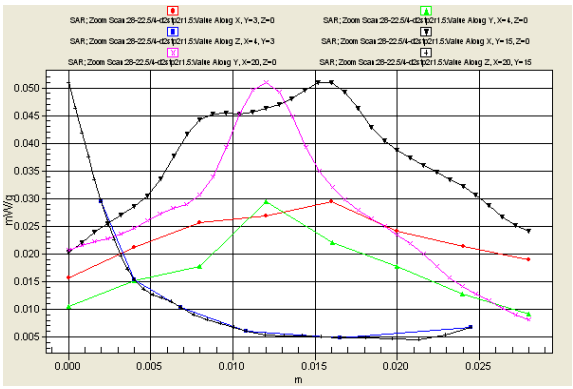
DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(4.16, 4.16, 4.16); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

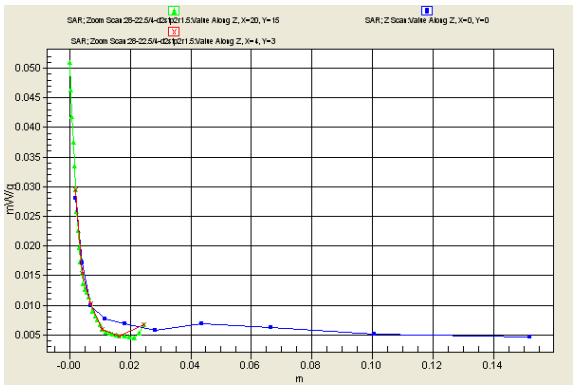
#1,M137,frt(patient)&d0,m5180(36),11a(6)/
Area Scan:100x70,stp10 (11x8x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.026 mW/g
Area Scan:100x70,stp10 (101x71x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (interpolated) = 0.028 mW/g
Z Scan (1x1x10): Measurement grid: dx=20mm, dy=20mm, dz=2mm; Maximum value of SAR (measured) = 0.028 mW/g

Zoom Scan:28-22.5/4-d2stp2r1.5 (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm;
Reference Value = 0.636 V/m; Power Drift = 0.20 dB, Maximum value of SAR (measured) = 0.030 mW/g
Peak SAR (extrapolated) = 0.051 W/kg
SAR(1 g) = 0.015 mW/g (Worst for 5180-5240MHz band); SAR(10 g) = 0.00697 mW/g









Additional information:
*.position: the distance of EUT to phantom: 0mm (2mm to liquid), liquid depth: 139mm
*.ambient: 25 deg.C / 53 %RH; .liquid temperature: (before) 24.0 deg.C. /(after) 24.0 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 23, 2011

Appendix 2-3: Measurement data (5180-5240MHz/W52 band)
Step 1: Contact side with the patient (Worst RF exposure condition for the patient)

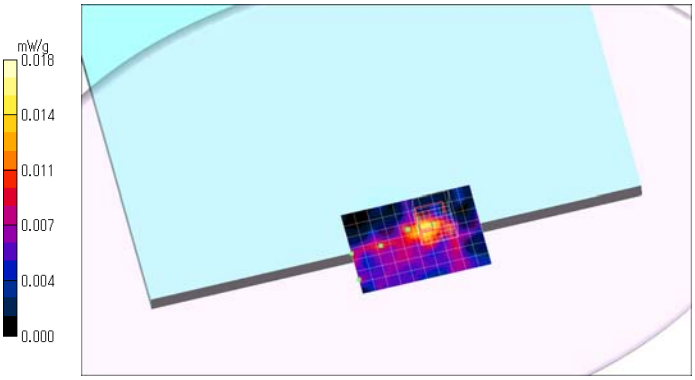
Step 1-1: Front-touch (with accessories (ANTI-SCATTER GRID and Handle Unit))

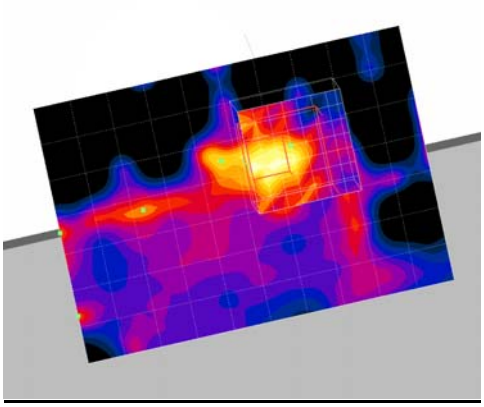
EUT: Digital Radiography with WLAN module; Type: CXDI-80C Wireless (WM5A2); Serial: 11DR-099 (WLAN module: DE2-12)
Communication System: 802.11a(6Mbps, OFDM); Frequency: 5180 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used(24.3deg.C): f = 5180 MHz; σ = 5.4 S/m; ε_r = 48.2; ρ = 1000 kg/m^3

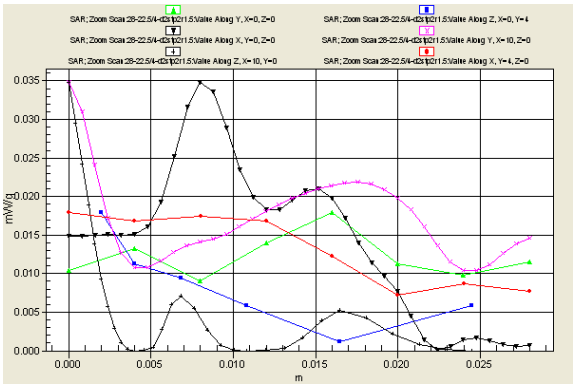
DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(4.16, 4.16, 4.16); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

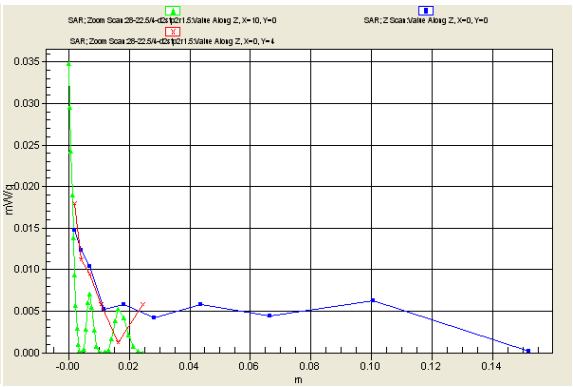
#3,M137,frt(patient)&d0&handle,m5180(36),11a(6)/
Area Scan:100x70,stp10 (11x8x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.013 mW/g
Area Scan:100x70,stp10 (101x71x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (interpolated) = 0.015 mW/g
Z Scan (1x1x10): Measurement grid: dx=20mm, dy=20mm, dz=2mm; Maximum value of SAR (measured) = 0.015 mW/g

Zoom Scan:28-22.5/4-d2stp2r1.5 (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm;
Reference Value = 1.13 V/m; Power Drift = -0.20 dB, Maximum value of SAR (measured) = 0.018 mW/g
Peak SAR (extrapolated) = 0.035 W/kg
SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00454 mW/g









Additional information:
*.position: the distance of EUT to phantom: 0mm (2mm to liquid), liquid depth: 139mm
*.ambient: 25 deg.C / 53 %RH; .liquid temperature: (before) 24.0 deg.C. /(after) 24.0 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 23, 2011

Appendix 2-4: Measurement data (5745-5825MHz/W58 band)

Step 1: Contact side with the patient (Worst RF exposure condition for the patient)

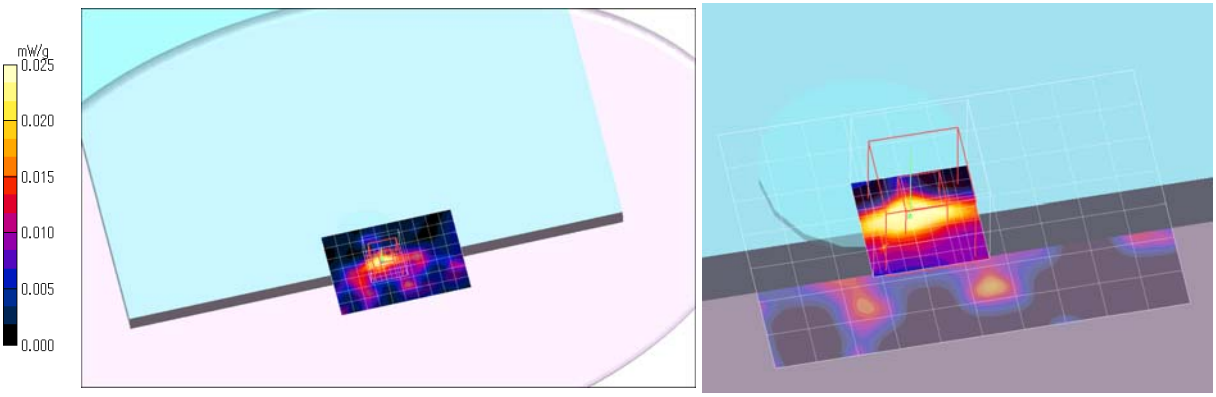
Step 1-1: Front-touch (without accessories (ANTI-SCATTER GRID and Handle Unit))

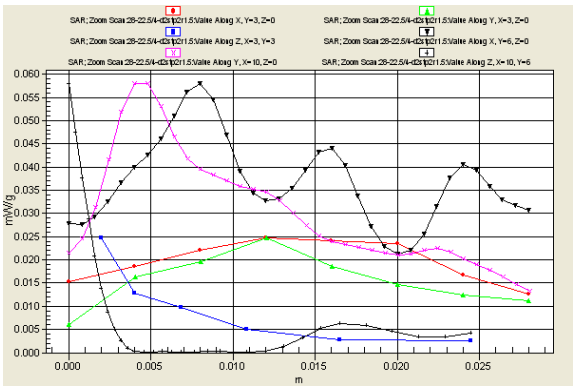
EUT: Digital Radiography with WLAN module; Type: CXDI-80C Wireless (WM5A2); Serial: 11DR-099 (WLAN module: DE2-12)
Communication System: 802.11a(6Mbps, OFDM); Frequency: 5785 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used(24.3deg.C): f = 5785 MHz; σ = 6.24 S/m; ε_r = 47.2; ρ = 1000 kg/m^3

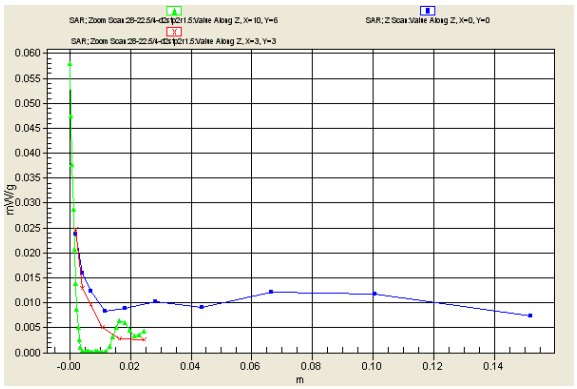
DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(3.5, 3.5, 3.5); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

#2,M137,frt(patient)&d0,m5785(157),11a(6)/
Area Scan:100x70,stp10 (11x8x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.030 mW/g
Area Scan:100x70,stp10 (101x71x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (interpolated) = 0.036 mW/g
Z Scan (1x1x10): Measurement grid: dx=20mm, dy=20mm, dz=2mm; Maximum value of SAR (measured) = 0.024 mW/g

Zoom Scan:28-22.5/4-d2stp2r1.5 (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm;
Reference Value = 1.20 V/m; Power Drift = 0.20 dB, Maximum value of SAR (measured) = 0.025 mW/g
Peak SAR (extrapolated) = 0.058 W/kg
SAR(1 g) = 0.014 mW/g (Worst for 5745-5825MHz band); SAR(10 g) = 0.0076 mW/g







Additional information:
*.position: the distance of EUT to phantom: 0mm (2mm to liquid), liquid depth: 139mm
*.ambient: 25 deg.C / 53 %RH; .liquid temperature: (before) 24.0 deg.C. /(after) 24.0 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 23, 2011

Appendix 2-4: Measurement data (5745-5825MHz/W58 band)
Step 1: Contact side with the patient (Worst RF exposure condition for the patient)

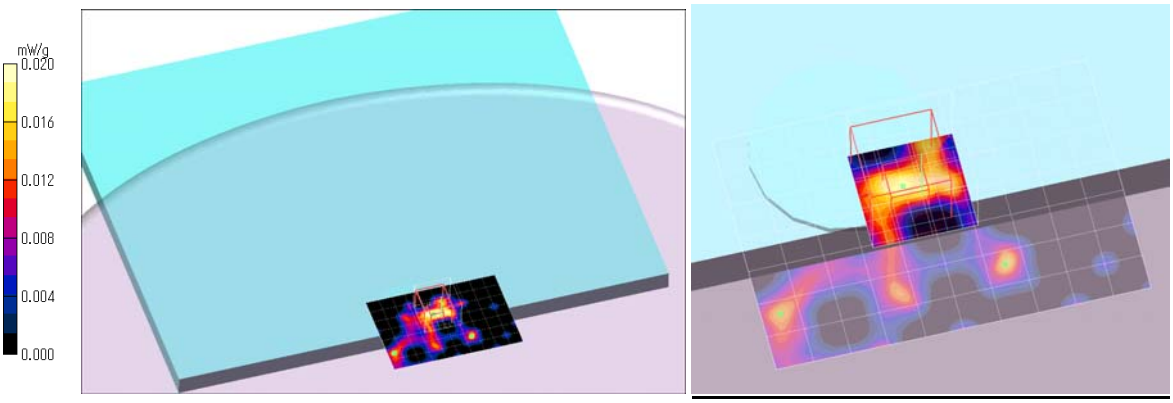
Step 1-2: Front-touch (with accessories (ANTI-SCATTER GRID and Handle Unit))

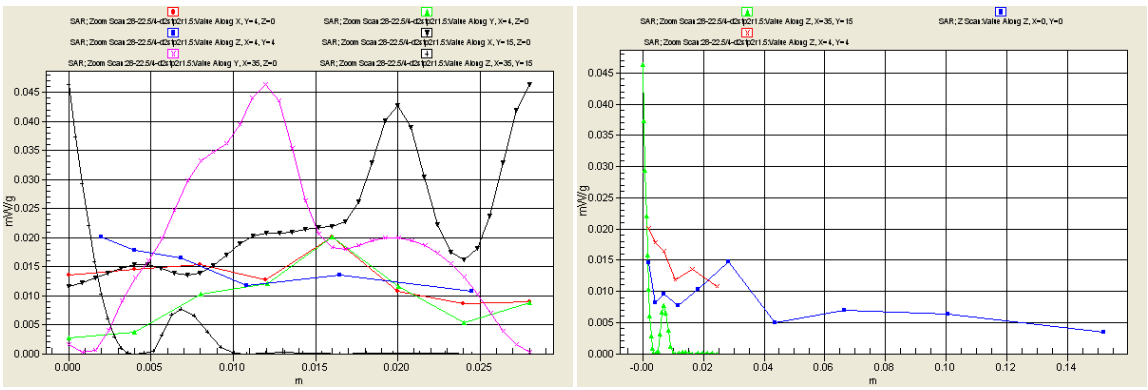
EUT: Digital Radiography with WLAN module; Type: CXDI-80C Wireless (WM5A2); Serial: 11DR-099 (WLAN module: DE2-12)
Communication System: 802.11a(6Mbps, OFDM); Frequency: 5785 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used(24.3deg.C): f = 5785 MHz; σ = 6.24 S/m; ε_r = 47.2; ρ = 1000 kg/m^3

DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(3.5, 3.5, 3.5); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

#4,M137,frt(patient)&d0&handle,m5785(157),11a(6)/
Area Scan:100x70,stp10 (11x8x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (measured) = 0.014 mW/g
Area Scan:100x70,stp10 (101x71x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (interpolated) = 0.023 mW/g
Z Scan (1x1x10): Measurement grid: dx=20mm, dy=20mm, dz=2mm; Maximum value of SAR (measured) = 0.015 mW/g

Zoom Scan:28-22.5/4-d2stp2r1.5 (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm;
Reference Value = 0.760 V/m; Power Drift = 0.20 dB, Maximum value of SAR (measured) = 0.020 mW/g
Peak SAR (extrapolated) = 0.046 W/kg
SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00607 mW/g





Additional information:
*.position: the distance of EUT to phantom: 0mm (2mm to liquid), liquid depth: 139mm
*.ambient: 25 deg.C / 53 %RH; .liquid temperature: (before) 24.0 deg.C. /(after) 24.0 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 23, 2011

APPENDIX 3: Test instruments

Appendix 3-1: Equipment used

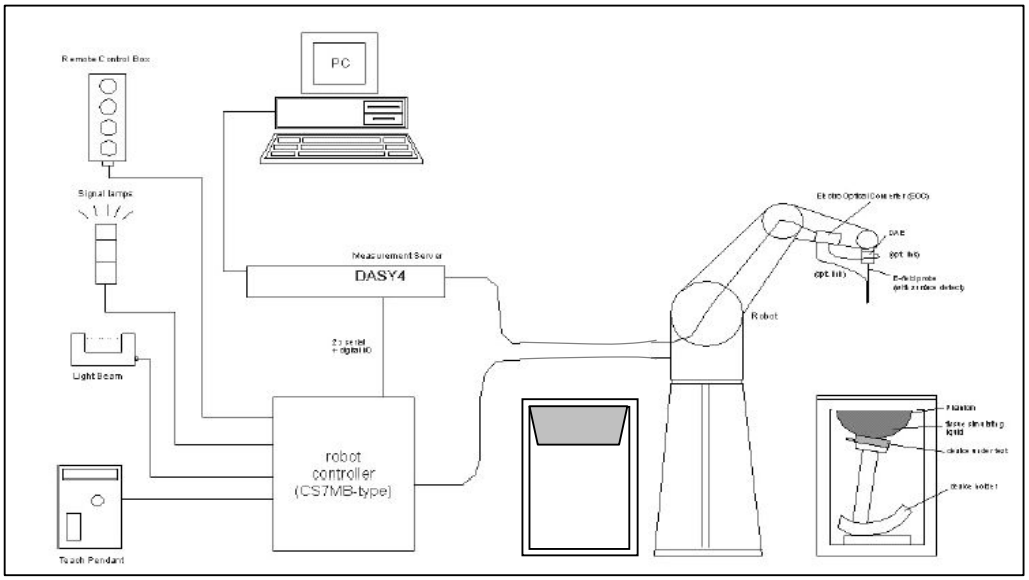
Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
COTS-KSAR-01	DASY4	Schmid&Partner Engineering AG	DASY4 V4.7 B80	-	SAR	-
COTS-KSEP-01	Dielectric measurement	Agilent	85070	1	SAR	-
KSAR-01	SAR measurement system	Schmid&Partner Engineering AG	DASY4	1088	SAR	Pre Check
SSRBT-01	SAR robot	Schmid&Partner Engineering AG	RX60B L	F04/5Z71A1/A /01	SAR	2011/02/02 * 12
KDAE-01	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	626	SAR	2011/02/10 * 12
KPB-R02	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3540	SAR	2010/07/13 * 12
KSDA-01	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	822	SAR	2011/01/05 * 24
KSDA-02	Dipole Antenna	Schmid&Partner Engineering AG	D5GHzV2	1070	SAR	2011/02/16 * 24
KPFL-01	Flat Phantom	Schmid&Partner Engineering AG	Oval flat phantom ELI 4.0	1059	SAR	Pre Check
SSNA-01	Network Analyzer	Agilent	8753ES	US39171777	SAR	2011/01/04 * 12
KEPP-01	Dielectric probe	Agilent	8710-2036	2540	SAR	2011/01/16 * 12
KSG-08	Signal Generator	Rohde & Schwarz	SMT06	100763	SAR	2010/06/11 * 12
KPA-12	RF Power Amplifier	MILMEGA	AS2560-50	1018582	SAR	Pre Check
KCPL-07	Directional Coupler	Pulsar Microwave Corp.	CCS30-B26	0621	SAR	Pre Check
KPM-06	Power Meter	Rohde & Schwarz	NRVD	101599	SAR	2010/09/03 * 12
KIU-08	Power sensor	Rohde & Schwarz	NRV-Z4	100372	SAR(Pf)	2010/09/03 * 12
KIU-09	Power sensor	Rohde & Schwarz	NRV-Z4	100371	SAR(dipl)	2010/09/03 * 12
KAT10-P1	Attenuator	Weinschel	24-10-34	BY5927	SAR	2011/02/17 * 12
KAT20-P1	Attenuator	TME	SFA-01AXPJ	-	SAR	2011/02/17 * 12
KRU-01	Ruler(300mm)	Shinwa	13134	-	SAR	2011/03/28 * 12
KRU-02	Ruler(150mm,L)	Shinwa	12103	-	SAR	2011/03/28 * 12
KRU-04	Ruler(300mm)	Shinwa	13134	-	SAR	2010/05/13 * 12
KRU-05	Ruler(100x50mm,L)	Shinwa	12101	-	SAR	2010/05/13 * 12
KOS-13	Digtal thermometer	HANNA	Checktemp-2	KOS-13	SAR	2011/01/19 * 12
KOS-14	Thermo-Hygrometer data logger	SATO KEIRYOKI	SK-L200THII α / SK-LTHII α-2	015246/08169	SAR	2011/01/19 * 12
SOS-11	Humidity Indicator	A&D	AD-5681	4063424	SAR	2011/02/23 * 12
KPM-08	Power meter	Anritsu	ML2495A	6K00003356	Ant.pwr	2010/09/22 * 12
KPSS-04	Power sensor	Anritsu	MA2411B	012088	Ant.pwr	2010/09/22 * 12
KAT10-S3	Attenuator	Agilent	8490D 010	50924	Ant.pwr	2010/07/16 * 12
KCC-D23	Microwave cable	Hirose Electric	U.FL-2LP-066J1-A-(200)	-	Ant.pwr	Pre Check
KSA-10	Spectrum Analyzer	Advantest	R3265A	45060268	SAR(moni.)	2011/01/17 * 12
KSLM245-01	Tissue simulation liqud (2450MHz,body)	Schmid&Partner Engineering AG	SL AAM 245	-	SAR	(Daily check) Target value ±5%
KSLM500-R1	Tissue simulation liqud (3.5-5.9GHz,body)	Schmid&Partner Engineering AG	SL AAM 501 AA	110111-1	SAR	(Daily check) Target value ±5%
No.7 Shielded room	SAR shielded room (2.76m(W)x3.76m(D)x2.4m(H))	TDK	-	-	SAR	*(Daily check) Ambient noise: < 12mW/kg*

The expiration date of 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 calibrations.
All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
[Test Item] SAR: Specific Absorption Rate, Ant.pwr: Antenna terminal conducted power

Appendix 3-2: 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 probes EX3DV4, SN: 3540 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [2] with accuracy of better than +/-10%. The spherical isotropy was evaluated with the procedure described in [3] and found to be better than +/-0.25 dB.

Appendix 3-3: Configuration and peripherals



The DASY4 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	A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
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	A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
7	A computer operating Windows XP.
8	DASY4 software.
9	Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
10	The phantom.
11	The device holder for EUT. (low-loss dielectric palette)
12	Tissue simulating liquid mixed according to the given recipes.
13	Validation dipole kits allowing to validate the proper functioning of the system.

Appendix 3-4: System components

1) EX3DV4 Probe Specification

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

Calibration (S/N 3540):
Basic broad band calibration in air.
Conversion Factors(Head and Body): 2450, 2600, 5200, 5300, 5500, 5600, 5800MHz

Frequency:
10 MHz to > 6GHz, Linearity: ±0.2 dB (30MHz to 6GHz)

Directivity:
±0.3 dB in HSL (rotation around probe axis)
±0.5 dB in tissue material (rotation normal to probe axis)

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

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

Application:
High precision 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%.

EX3DV4 E-field Probe

2a) Phantom (Flat type)

Construction:
A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom position and measurement grids by manually teaching three points with the robot.

Shell Thickness:
Bottom plate: 2 ±0.2mm

Dimensions:
Bottom elliptical: 600×400mm, Depth: 190mm

Filling Volume:
Approx. 30 liters

ELI4.0 flat phantom

Appendix 3-5: Test system specification

RX60L Robot

•Number of Axes	:	6	•Payload	:	1.6 kg
•Reach	:	800mm	•Repeatability	:	±0.025mm
•Control Unit	:	CS7M	•Programming Language	:	V+
•Manufacture	:	Stäubli Unimation Corp. Robot Model: RX60			

DASY4 Measurement server

•Features	:	166MHz low power Pentium MMX. 32MB chipdisk and 64MB RAM Serial link to DAE (with watchdog supervision) 16 Bit A/D converter for surface detection system. Two serial links to robot (one for real-time communication which is supervised by watchdog) Ethernet link to PC (with watchdog supervision). Emergency stop relay for robot safety chain. Two expansion slots for future applications.
•Manufacture	:	Schmid & 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	:	1µV to > 200mV (16bit resolution and two range settings: 4mV, 400mV)			
•Input Offset voltage	:	< 1µV (with auto zero)			
•Input Resistance	:	200MΩ	•Battery Power	:	> 10hr of operation (with two 9V battery)
•Dimension	:	60×60×68mm	•Manufacture	:	Schmid & Partner Engineering AG

Software

•Item	:	Dosimetric Assessment System DASY4			
•Software version No.	:	DASY4, V4.7 B80	•Manufacture / Origin	:	Schmid & Partner Engineering AG

E-Field Probe

•Model	:	EX3DV4 (sn: 3540)	•Construction	:	Symmetrical design with triangular core
•Frequency	:	10MHz to 6GHz	•Linearity	:	±0.2dB (30MHz to 3GHz)
•Manufacture	:	Schmid & Partner Engineering AG			

Phantom (1)

•Type	:	ELI 4.0 oval flat phantom	•Shell Material	:	Fiberglass
•Shell Thickness	:	Bottom plate: 2 ±0.2mm	•Dimensions	:	Bottom elliptical: 600×400mm, Depth: 190mm
•Manufacture	:	Schmid & Partner Engineering AG			

Appendix 3-6: Simulated tissue composition

Ingredient	Mixture (%)
	Body 2450MHz (type: SL AAM 245)
Water	52-75 %
$C_8H_{18}O_3$ (Diethylene glycol monobutyl ether (DGBE))	25-48%
NaCl	<1.0%
Manufacture	Schmid&Partner Engineering AG

Ingredient	Mixture (%)
	Body 5800MHz (type: SL AAM 501 AA)
Water	60-78 %
Mineral Oil	11-36 %
Emulsifiers	0.5-15 %
Additives and Salt	0.4-3 %
Manufacture	Schmid&Partner Engineering AG

Appendix 3-7: Simulated tissue parameter confirmation

The dielectric parameters were checked prior to assessment using the 85070E dielectric probe kit.
The dielectric parameters measurement is reported in each correspondent section.

Dielectric parameter measurement results														
Date	Freq. [MHz]	Ambient		Liq.T.[deg.C.]		Liquid Depth [mm]	Parameters	Target value		Measured	Deviation for #1 (Std.)[%]	Limit [%]	Deviation for #2 (Cal.)[%]	Limit [%]
		Temp [deg.C.]	Humidity [%RH]	Before	After			#1:Std. (*1)	#2:Cal. (*2)					
May 23, 2011	5200	24.8	56	24.3	24.3	(139)	Relative permittivity: εr [-]	**49.0**	**47.2**	48.20	**-1.7**	±5	**+2.1**	±5
							Conductivity: σ [S/m]	**5.30**	**5.37**	5.445	**+2.7**	±5	**+1.4**	±5
	5800						Relative permittivity: εr [-]	**48.2**	**46.2**	47.15	**-2.2**	±5	**+2.1**	±5
							Conductivity: σ [S/m]	**6.00**	**6.16**	6.275	**+4.6**	±5	**+1.9**	±5
May 24, 2011	2450	24.9	54	23.9	24.0	(158)	Relative permittivity: εr [-]	**52.7**	**52.5**	50.49	**-4.2**	±5	**-3.8**	±5
							Conductivity: σ [S/m]	**1.95**	**1.96**	1.916	**-1.7**	±5	**-2.2**	±5

*1. The target value is a parameter defined in OET65, Supplement C.

*2 For 5200/5800MHz, the target value is of a parameter defined in the calibration data sheet of D5GHzV2 (sn:1070) dipole calibrated by Schmid & Partner Engineering AG (Certification No. D5GHzV2-1070_Feb11, the data sheet was failed in this report.).
For 2450MHz, the target value is of a parameter defined in the calibration data sheet of D2450V2 (sn:822) dipole calibrated by Schmid & Partner Engineering AG (Certification No. D2450V2-822_Jan11, the data sheet was failed in this report.).

***. Decision on Simulated Tissues of 5180-5825MHz SAR tested and validated frequencies.**

In the current standards (e.g., IEEE 1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given at 3000MHz and 5800MHz. As an intermediate solution, dielectric parameters for the frequencies between 5000 to 5800 MHz were obtained using linear interpolation. Therefore the dielectric parameters of 5200MHz (the frequency for the validation) and 5180MHzwere decided as following.

Standard and interpolated dielectric parameters for head and body tissue simulating liquid in the frequency range 3000 to 5800MHz.

f (MHz)	Head Tissue		Body Tissue		Reference
	εr	σ [S/m]	εr	σ [S/m]	
3000	**38.5**	**2.40**	**52.0**	**2.73**	**Standard**
5800	**35.3**	**5.27**	**48.2**	**6.00**	**Standard**
5180	-	-	49.0	5.28	Interpolated
5200	-	-	49.0	5.30	Interpolated
5785	-	-	48.2	5.98	Interpolated

Appendix 3-8: System validation data

Prior to the SAR assessment of EUT, 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.

System validation results															
Date	Freq. [MHz]	Liquid Type	Ambient		Liquid Temp. [deg.C.]			Liquid Depth [mm]	Permittivity measured εr [-]	Conductivity measured σ [S/m]]	Power drift [dB]	System dipole validation target & measured			
												SAR 1g [W/kg] (at 1W)		Deviation [%]	Limit [%]
			Temp [deg.C.]	Humidity [%RH]	Check	Before	After					Target value	Measured (*5)		
May 23, 2011	5200	Body	24.8	53	24.3	24.1	24.0	139	48.2	5.44	-0.031	**77.1**(*3)	80.6 (8.06 (at 100mW))	**+4.5**	±10
	5800	Body	24.8	53	24.3	24.0	24.0	139	47.2	6.28	0.0924	**72.4**(*3)	77.8 (7.78 (at 100mW))	**+7.5**	±10
May 24, 2011	2450	Body	24.8	54	23.9	23.9	23.8	158	50.5	1.92	-0.00695	**50.9**(*4)	48.4 (12.1 (at 250mW))	**-4.9**	±10

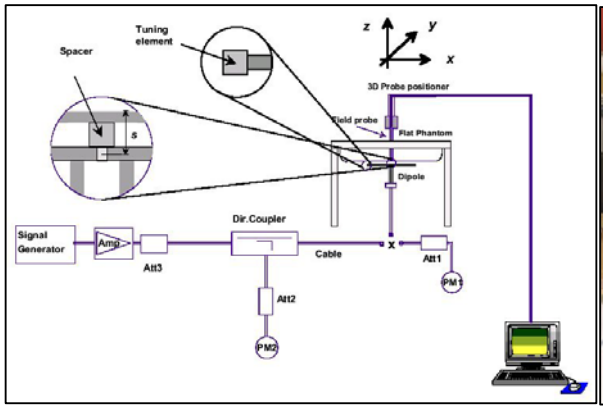
Note: Refer to Appendix 3-10 Validation measurement data for the above result representation in plot data.

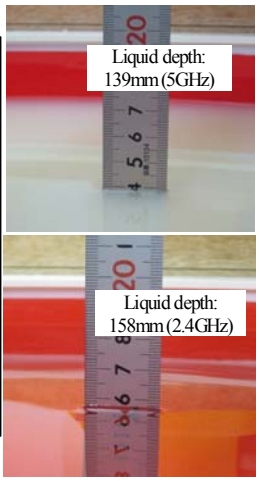
*3. The target value is a parameter defined in the calibration data sheet of D5GHzV2(sn:1070) dipole calibrated by Schmid & Partner Engineering AG (Certification No. D5GHzV2-1070_Feb11, the data sheet was failed in this report.).

*4. The target value is a parameter defined in the calibration data sheet of D2450V2 (sn:822) dipole calibrated by Schmid & Partner Engineering AG (Certification No. D2450V2-822_Jan11, the data sheet was failed in this report.).
*. We performed the system validation based on FCC requirement, "The 1-g or 10-g SAR values measured using the required tissue dielectric parameters should be within 10% of manufacturer calibrated dipole SAR values. However these manufacturer calibrated dipole target SAR values should be substantially similar to those defined in IEEE Standard 1528." and FCC permits "SAR system verification with the actual liquid used for EUT's SAR measurement, should be the default operating procedures." We confirmed the this dipole manufacture's validation data for head is within 5% against IEEE Standard 1528 (manufacture's cal.: 54.4W/kg (+3.8% vs. std.: 52.4W/kg). so we can only use Body liquid validation data for our system verification

*5. The measurement value was normalized to 1W forward power.

Appendix 3-8: System validation data (cont'd)





Test setup for the system performance check

Appendix 3-9: Validation measurement data

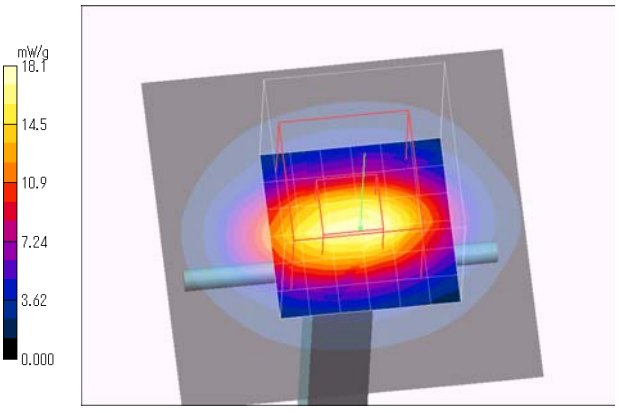
2450MHz system check (Body) / Forward conducted power: 250mW

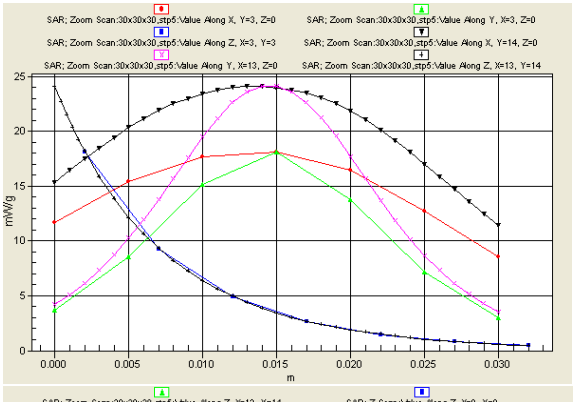
EUT: Dipole 2450 MHz; Type: D2450V2; Serial: 822
Communication System: CW; Frequency: 2450 MHz; Crest Factor: 1.0
Medium: M2450; Medium parameters used(23.9deg.C): f = 2450 MHz; σ = 1.92 S/m; ε_r = 50.5; ρ = 1000 kg/m^3

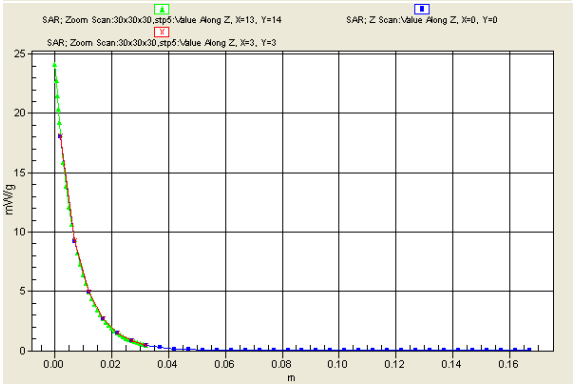
DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(8.05, 8.05, 8.05); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan:60x60,stp15 (41x41x1): Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (interpolated) = 18.3 mW/g
Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 18.0 mW/g

Zoom Scan:30x30x30,stp5 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm;
Reference Value = 99.5 V/m; Power Drift = -0.007 dB,
Maximum value of SAR (measured) = 18.1 mW/g
Peak SAR (extrapolated) = 24.1 W/kg (-10.7%, vs.speag-cal.=27.0W/kg)
SAR(1 g) = 12.1 mW/g(-4.9%, vs.speag-cal.=12.73mW/g);
SAR(10 g) = 5.73 mW/g







Additional information:
*.position: the distance of dipole to phantom: 8mm (10mm to liquid), liquid depth: 158mm
*.ambient: 24.8 deg.C / 54 %RH,
*..liquid temperature: (before) 23.9 deg.C. /(after) 23.8 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 24, 2011

Appendix 3-9: Validation measurement data (cont'd)

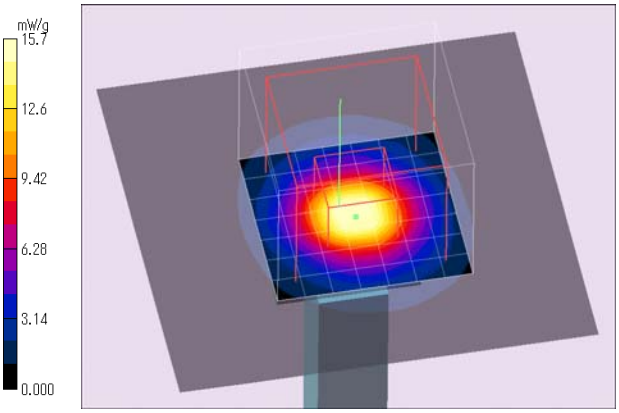
5200MHz system check (Body) / Forward conducted power: 1000mW

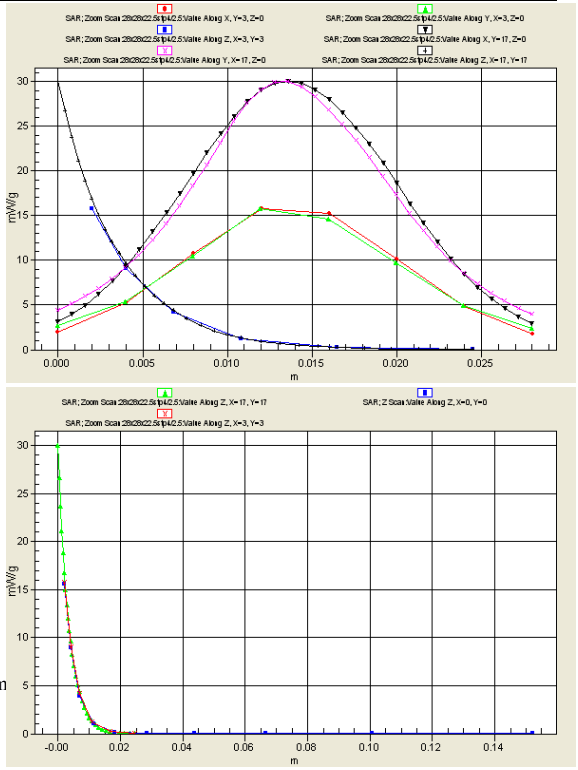
EUT: Dipole 5GHz; Type: D5GHzV2; Serial: 1070
Communication System: CW; Frequency: 5200 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used(24.3deg.C): f = 5200 MHz; σ = 5.44 S/m; ε_r = 48.2; ρ = 1000 kg/m^3

DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(4.16, 4.16, 4.16); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan:60x60,stp10 (61x61x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (interpolated) = 16.8 mW/g
Z Scan (1x1x10): Measurement grid: dx=20mm, dy=20mm, dz=2mm; Maximum value of SAR (measured) = 15.5 mW/g

Zoom Scan:28x28x22.5stp4/2.5 (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm;
Reference Value = 61.1 V/m; Power Drift = -0.031 dB,
Maximum value of SAR (measured) = 15.7 mW/g
Peak SAR (extrapolated) = 30.1 W/kg (-3.2%, vs.speag-cal.=31.1W/kg)
SAR(1 g) = 8.06 mW/g(+4.5%, vs.speag-cal.=7.71mW/g);
SAR(10 g) = 2.33 mW/g





Additional information:
*.position: the distance of dipole to phantom: 8mm (10mm to liquid), liquid depth: 139mm
*.ambient: 25 deg.C / 53 %RH;
*..liquid temperature: (before) 24.1 deg.C. /(after) 24.0 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 23, 2011

Appendix 3-9: Validation measurement data (cont'd)

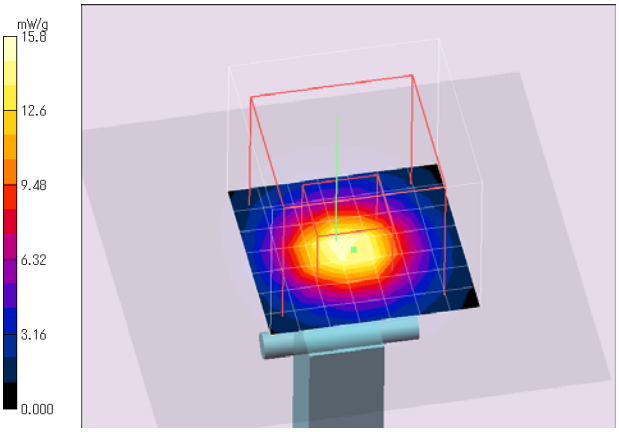
5800MHz system check (Body) / Forward conducted power: 1000mW

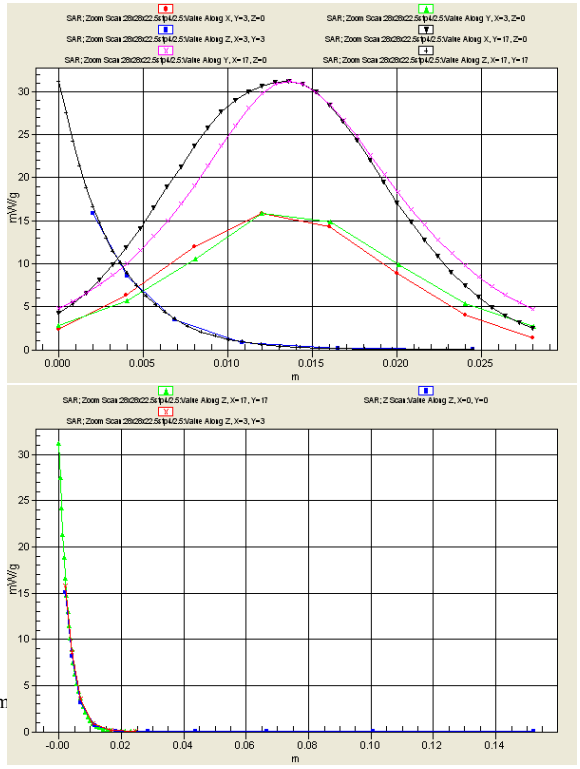
EUT: Dipole 5GHz; Type: D5GHzV2; Serial: 1070
Communication System: CW; Frequency: 5800 MHz; Crest Factor: 1.0
Medium: MSL5800; Medium parameters used(24.3deg.C): f = 5800 MHz; σ = 6.28 S/m; ε_r = 47.2; ρ = 1000 kg/m^3

DASY4 Configuration:
- Probe: EX3DV4 - SN3540; ConvF(3.5, 3.5, 3.5); Calibrated: 2010/07/13
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn626; Calibrated: 2011/02/10
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1059; Phantom section: Flat Section
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan:60x60,stp10 (61x61x1): Measurement grid: dx=10mm, dy=10mm; Maximum value of SAR (interpolated) = 16.9 mW/g
Z Scan (1x1x10): Measurement grid: dx=20mm, dy=20mm, dz=2mm; Maximum value of SAR (measured) = 15.1 mW/g

Zoom Scan:28x28x22.5stp4/2.5 (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm;
Reference Value = 56.6 V/m; Power Drift = 0.092 dB,
Maximum value of SAR (measured) = 15.8 mW/g
Peak SAR (extrapolated) = 31.2 W/kg (-5.5%, vs.speag-cal.=33.0W/kg)
SAR(1 g) = 7.78 mW/g (+7.5%, vs.speag-cal.=7.24mW/g);
SAR(10 g) = 2.2 mW/g





Additional information:
*.position: the distance of dipole to phantom: 8mm (10mm to liquid), liquid depth: 139mm
*.ambient: 25 deg.C / 53 %RH; .
*.liquid temperature: (before) 24.0 deg.C. /(after) 24.0 deg.C.
*.white cubic: zoom scan area, red big cubic: SAR(10g), red small cubic: SAR(1g)
*.Tested by: Hiroshi Naka / Tested place:No.7 shielded room / Date tested: May 23, 2011

Appendix 3-10: Validation uncertainty

Uncertainty of system check setup	Under 3GHz	
	1g SAR	10g SAR
combined measurement uncertainty of the measurement system (k=1)	**± 9.9%**	± 9.6%
expanded uncertainty (k=2)	**± 19.9%**	± 19.3%

	Error Description	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	vi, veff
A	**Measurement System**						(std.uncertainty)	(std.uncertainty)	
1	Probe calibration	±5.9 %	Normal	1	1	1	±5.9 %	±5.9 %	∞
2	Axial isotropy	±4.7 %	Rectangular	√3	0.7	0.7	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy (flat, <5°)	±2.6 %	Rectangular	√3	0.7	0.7	±1.1 %	±1.1 %	∞
4	Boundary effects	±1.0 %	Rectangular	√3	1	1	±1.2 %	±1.2 %	∞
5	Probe linearity	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
6	System detection limit	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	System readout electronics	±0.3 %	Normal	1	1	1	±0.3 %	±0.3 %	∞
8	Response time	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
9	Integration time	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
10	RF ambient - noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
11	RF ambient - reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	Probe positioner mechanical tolerance	±0.4 %	Rectangular	√3	1	1	±0.2 %	±0.2 %	∞
13	Probe positioning with respect to phantom shell	±2.9 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
14	Max.SAR evaluation	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
B	**Dipole**								
15	Dipole axis to liquid distance	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2 %	∞
16	Input power and SAR drift measurement	±4.7 %	Rectangular	√3	1	1	±4.7 %	±4.7 %	3
C	**Phantom and Setup**								
17	Phantom uncertainty	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
18	Liquid conductivity (target)	±5.0 %	Rectangular	√3	0.64	0.43	±1.8 %	±1.2 %	∞
19	Liquid conductivity (meas.)	±2.9 %	Normal	1	0.64	0.43	±1.9 %	±1.2 %	3
20	Liquid permittivity (target)	±5.0 %	Rectangular	√3	0.6	0.49	±1.7 %	±1.4 %	∞
21	Liquid permittivity (meas.)	±2.9 %	Normal	1	0.6	0.49	±1.7 %	±1.4 %	3
	Combined Standard Uncertainty						**±9.9** %	**±9.6** %	88
	Expanded Uncertainty (k=2)						**±19.9** %	**±19.3** %	

*. This measurement uncertainty budget is suggested by IEEE 1528 and determined by Schmid & Partner Engineering AG.[6]

Uncertainty of SAR measurement system /Validation	5~6 GHz	
	1g SAR	10g SAR
combined measurement uncertainty of the measurement system (k=1)	**± 12.1%**	± 11.9%
expanded uncertainty (k=2)	**± 24.2%**	± 23.7%

	Error Description	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	vi, veff
A	**Measurement System**						(std.uncertainty)	(std.uncertainty)	
1	Probe calibration	±6.8 %	Normal	1	1	1	±6.8 %	±6.8 %	∞
2	Axial isotropy	±4.7 %	Rectangular	√3	0.7	0.7	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy (*flat phantom, <5°)	±2.6 %	Rectangular	√3	0.7	0.7	±1.1 %	±1.1 %	∞
4	Boundary effects	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2 %	∞
5	Probe linearity	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
6	System detection limit	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	System readout electronics	±0.3 %	Normal	1	1	1	±0.3 %	±0.3 %	∞
8	Response time	±0.8 %	Rectangular	√3	1	1	±0 %	±0 %	∞
9	Integration time	±2.6 %	Rectangular	√3	1	1	±0 %	±0 %	∞
10	RF ambient - noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
11	RF ambient - reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	Probe positioner mechanical tolerance	±0.8 %	Rectangular	√3	1	1	±0.5 %	±0.5 %	∞
13	Probe positioning with respect to phantom shell	±9.9 %	Rectangular	√3	1	1	±5.7 %	±5.7 %	∞
14	Max.SAR evaluation	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
B	**Dipole**								
15	Dipole axis to liquid distance	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2%	∞
16	Input power and SAR drift measurement	±4.7 %	Normal	1	1	1	±4.7 %	±4.7 %	∞
C	**Phantom and Setup**								
17	Phantom uncertainty	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
18	Liquid conductivity (target)	±5.0 %	Rectangular	√3	0.64	0.43	±1.8 %	±1.2 %	∞
19	Liquid conductivity (meas.)	±3.0 %	Normal	1	0.64	0.43	±1.9 %	±1.3 %	∞
20	Liquid permittivity (target)	±5.0 %	Rectangular	√3	0.6	0.49	±1.7 %	±1.4 %	∞
21	Liquid permittivity (meas.)	±3.2 %	Normal	1	0.6	0.49	±1.9 %	±1.6 %	∞
	Combined Standard Uncertainty						**±12.1** %	**±11.9** %	∞
	Expanded Uncertainty (k=2)						**±24.2** %	**±23.7** %	

*. This measurement uncertainty budget is suggested by Schmid & Partner Engineering AG. [6]