# APPENDIX 2 : SAR Measurement data

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

**1. Evaluation procedure**

**The evaluation was performed with the following procedure:**

**Step 1:** Measurement of the E-field at a fixed location above the ear point or 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 the horizontal grid spacing was 10 mm x 10 mm . Based on these data, the area of the maximum absorption was determined by spline interpolation.

**Step 3:** Around this point found in the Step 2 (area scan) , a volume of 28mm x 28mm x 25mm was assessed by measuring 8 x 8 x 11 points. And for any secondary peaks found in the Step2 which are within 2dB of maximum peak (level more than ambient noise ($\geq$0.012 W/kg)) 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 1.3 mm. 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 (1 g or 10 g) 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 x 10 x 10) were interpolated to calculate the average.

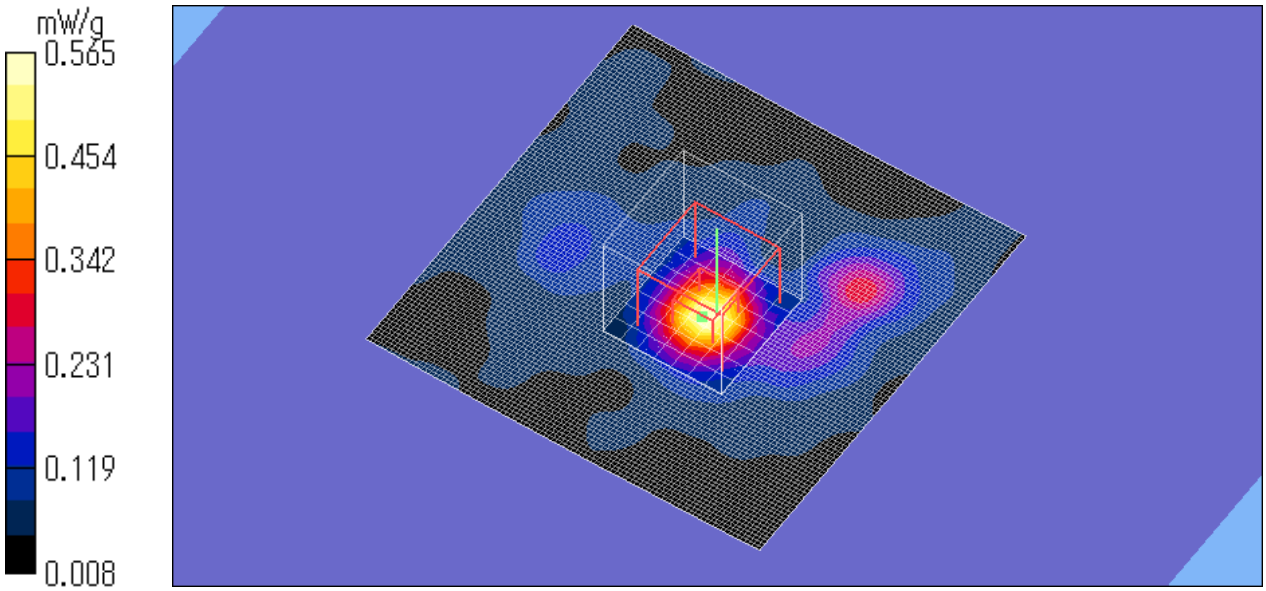
(3). All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

**Step 4**: Re-measurement of the E-field at the same location as in Step 1.

**2. SAR measurement data (11a Low band)**

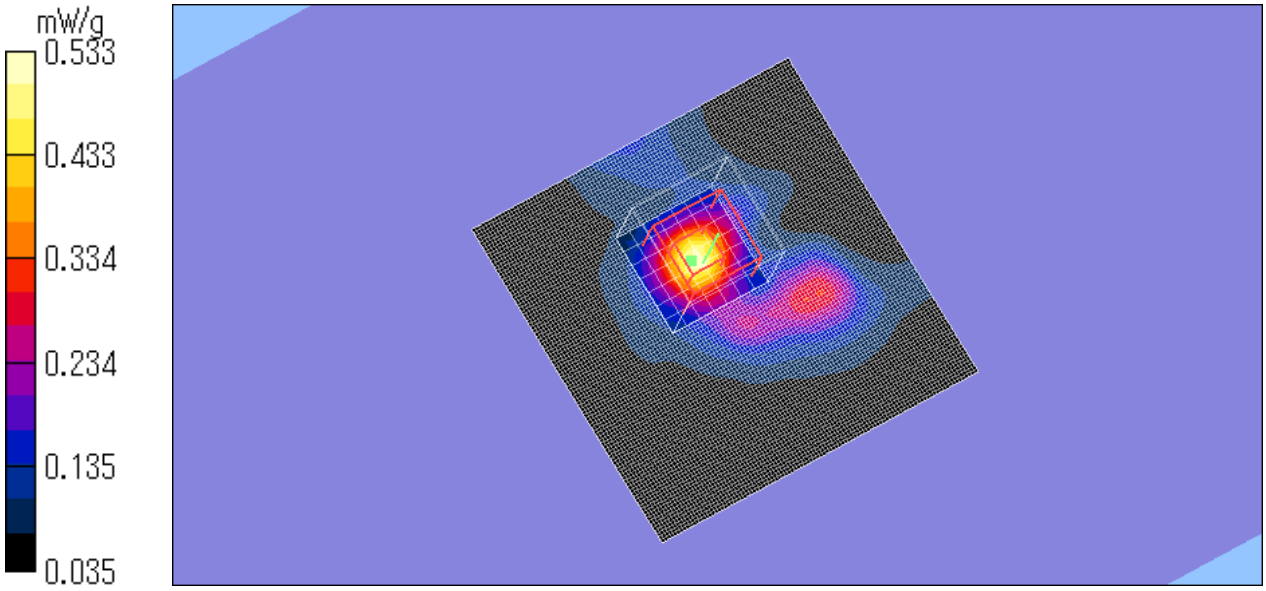
**SX-10WAG/Rear（Ant.down）/5260MHz/11a BPSK(9Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.602 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 9.41 V/m; Power Drift = -0.198 dB
Peak SAR (extrapolated) = 1.02 W/kg
**SAR(1 g) = 0.324 mW/g; SAR(10 g) = 0.140 mW/g**
Maximum value of SAR (measured) = 0.565 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.3 degree.C , After 23.3 degree.C



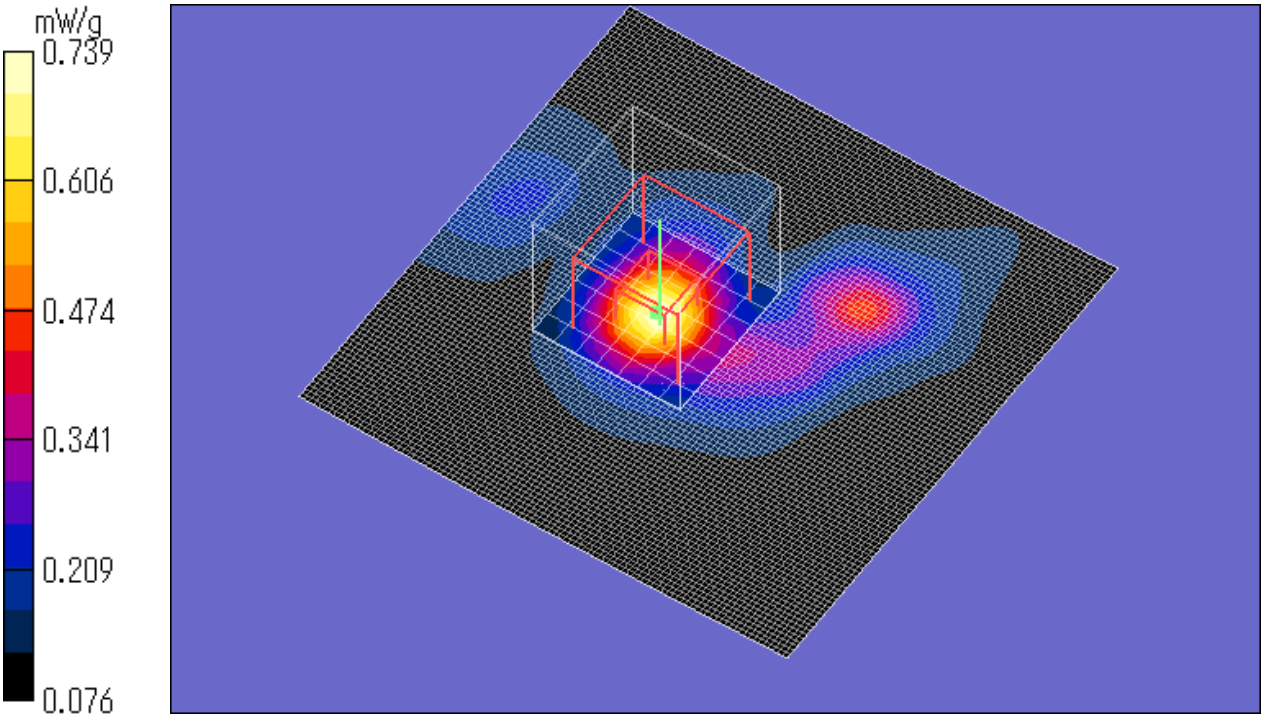
**SX-10WAG/Rear（Ant.down）/5260MHz/11a QPSK(18Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.554 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 6.94 V/m; Power Drift = -0.182 dB
Peak SAR (extrapolated) = 1.03 W/kg
**SAR(1 g) = 0.310 mW/g; SAR(10 g) = 0.144 mW/g**
Maximum value of SAR (measured) = 0.533 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.3 degree.C , After 23.3 degree.C



**SX-10WAG/Rear（Ant.down）/5260MHz/11a 16QAM(36Mbps)**

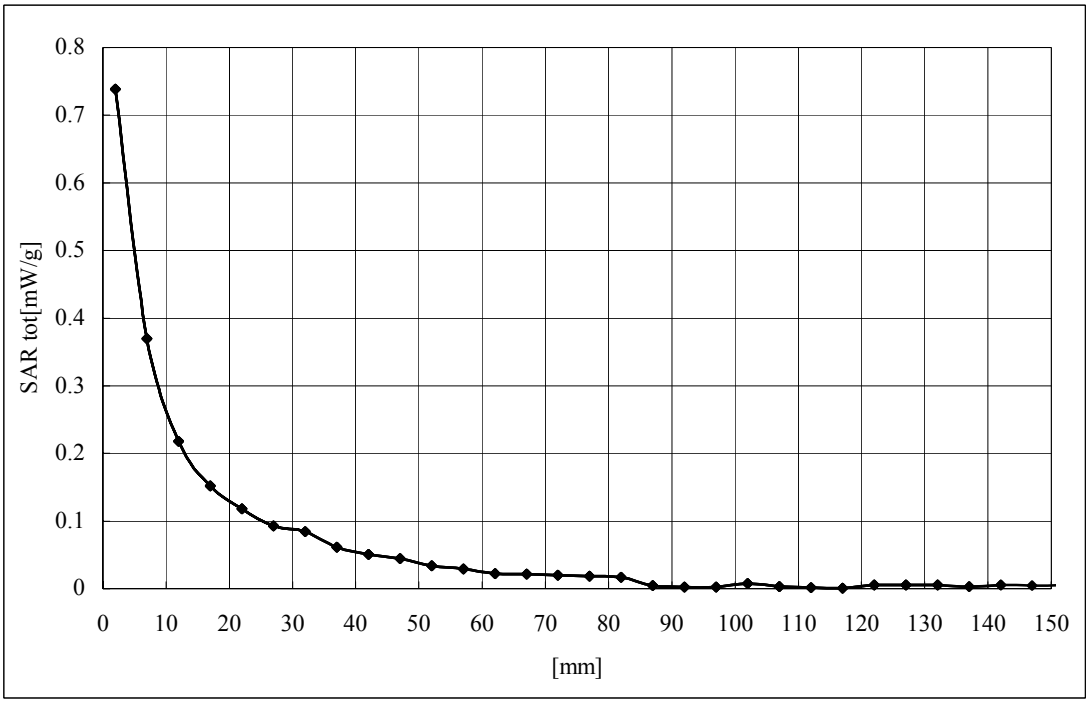
Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.750 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 9.10 V/m; Power Drift = -0.161 dB
Peak SAR (extrapolated) = 1.42 W/kg
**SAR(1 g) = 0.440 mW/g; SAR(10 g) = 0.210 mW/g**
Maximum value of SAR (measured) = 0.739 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.3 degree.C , After 23.3 degree.C



**Z-axis scan at max SAR location**

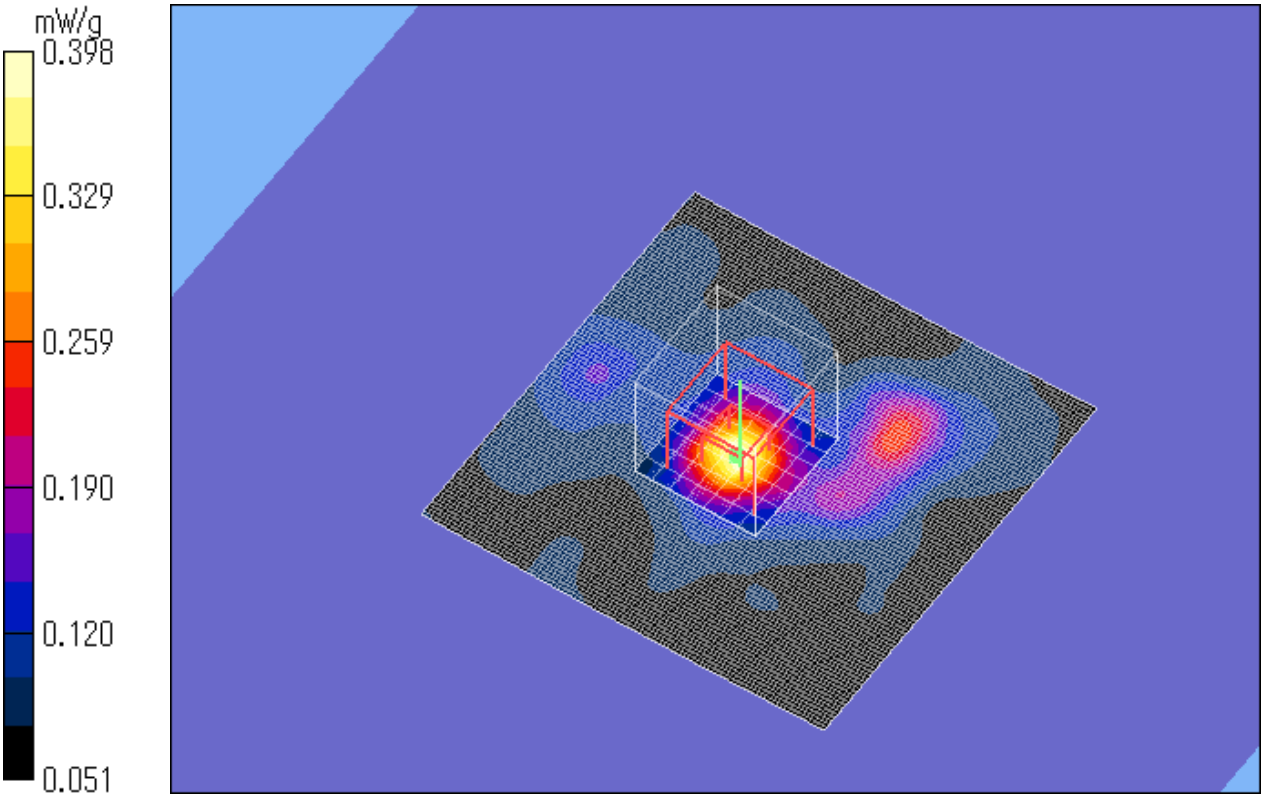
**SX-10WAG/Rear（Ant.down）/5260MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160



**SX-10WAG/Rear（Ant.down）/5260MHz/11a 64QAM(54Mbps)**

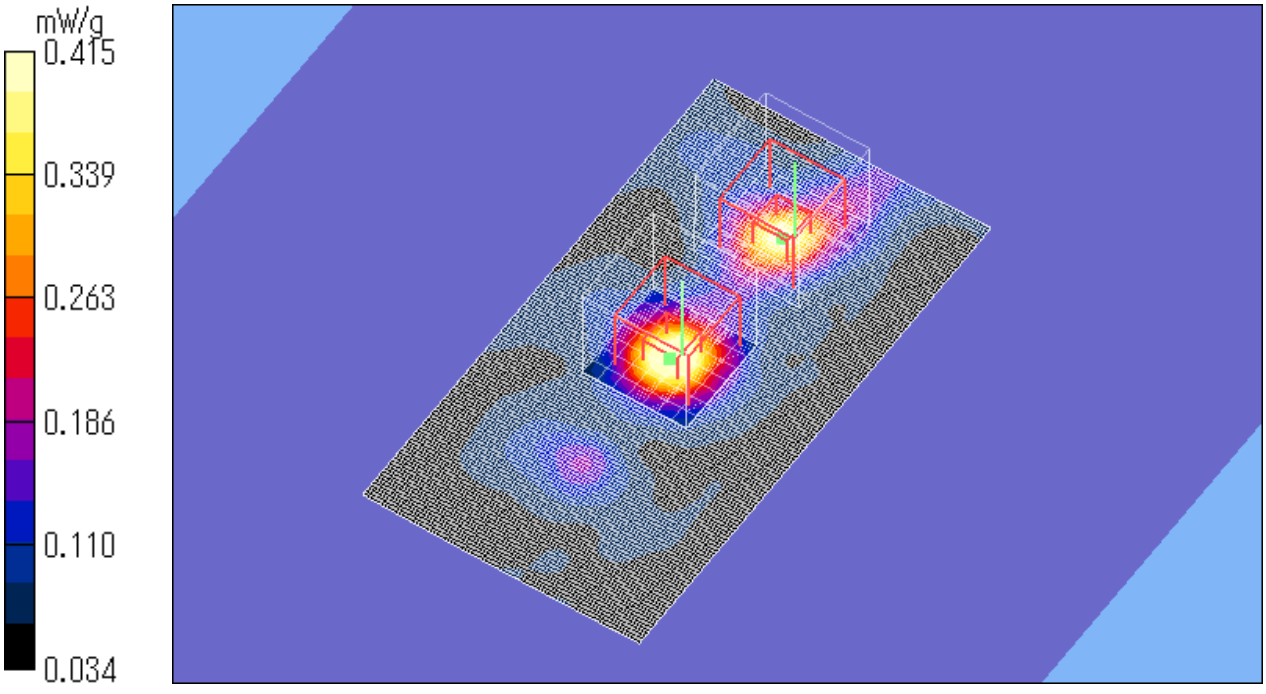
Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.408 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 8.97 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 0.801 W/kg
**SAR(1 g) = 0.250 mW/g; SAR(10 g) = 0.136 mW/g**
Maximum value of SAR (measured) = 0.398 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.3 degree.C , After 23.3 degree.C



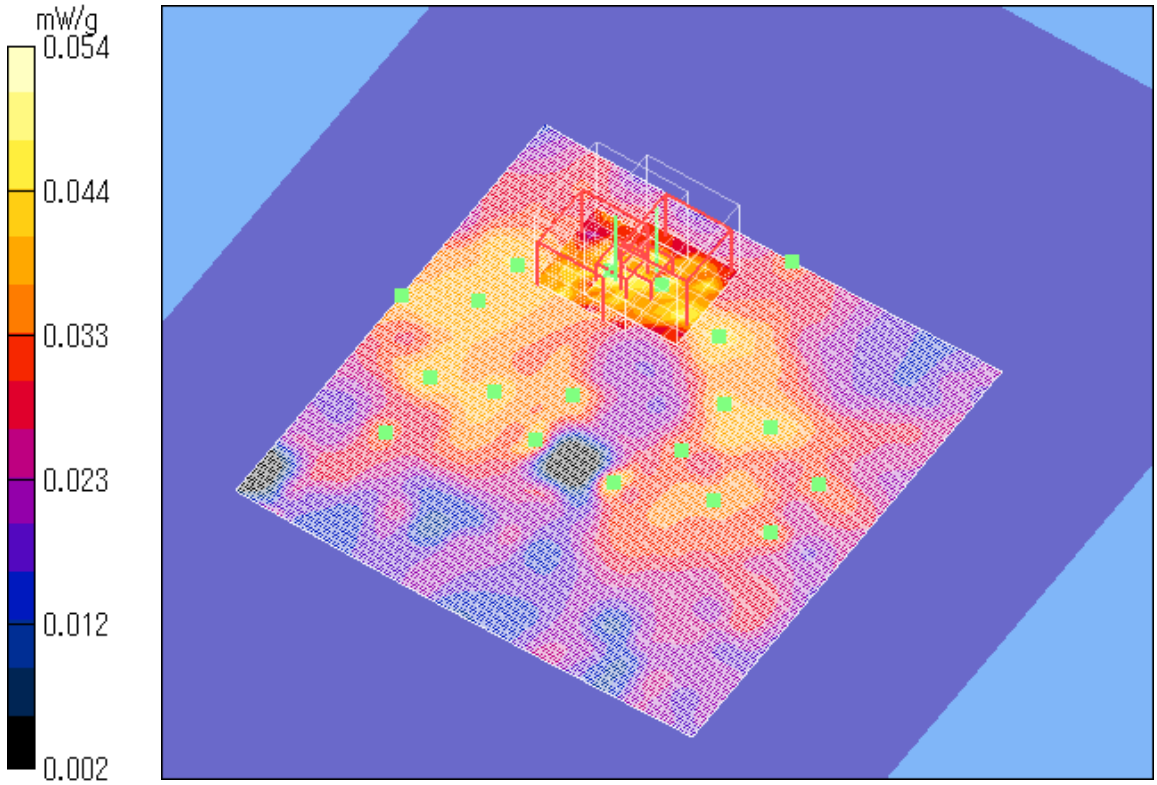
**SX-10WAG/Rear（Ant.up）/5260MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

**Area Scan (81x151x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.527 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.2 V/m; Power Drift = -0.163 dB
Peak SAR (extrapolated) = 1.00 W/kg
**SAR(1 g) = 0.299 mW/g; SAR(10 g) = 0.141 mW/g**
Maximum value of SAR (measured) = 0.500 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.2 V/m; Power Drift = -0.163 dB
Peak SAR (extrapolated) = 0.812 W/kg
**SAR(1 g) = 0.256 mW/g; SAR(10 g) = 0.125 mW/g**
Maximum value of SAR (measured) = 0.415 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.3 degree.C , After 23.4 degree.C



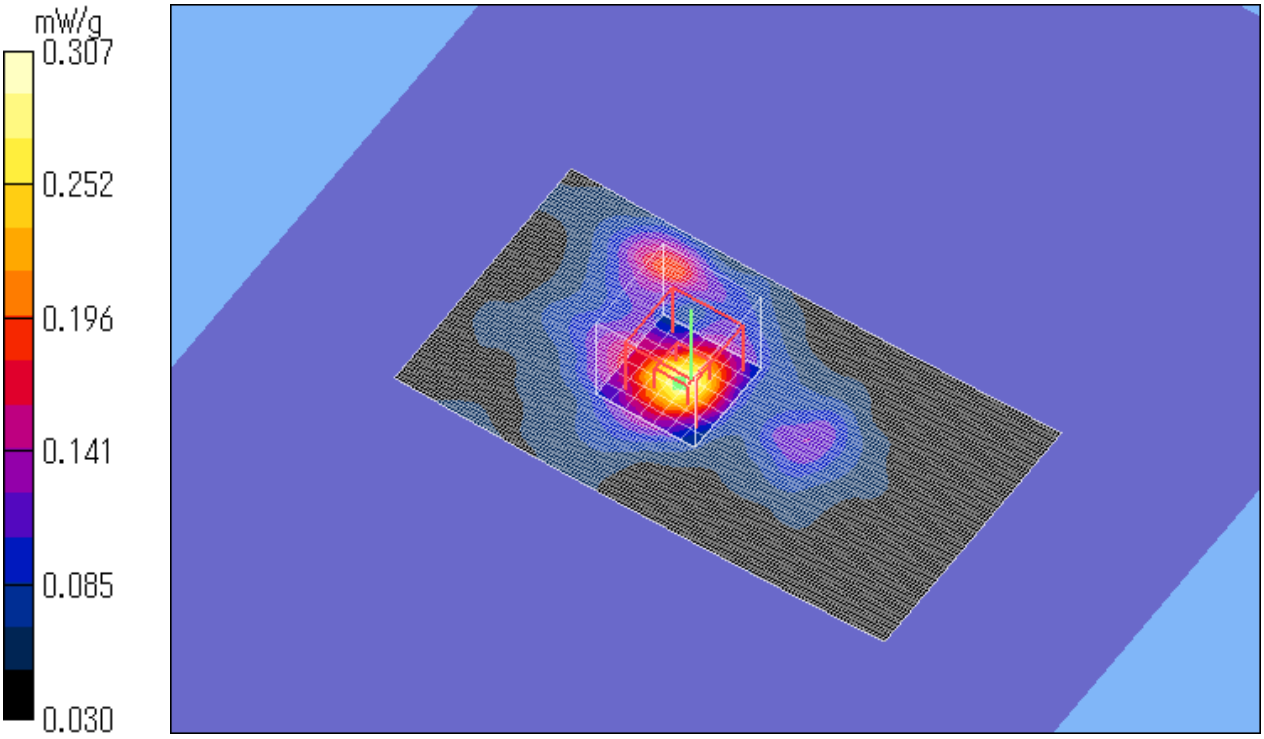
**SX-10WAG/Right Side（Ant.down）/5260MHz/11a 16QAM(36Mbps)**
Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (151x151x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.050 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.91 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 0.098 W/kg
**SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.021 mW/g**
Maximum value of SAR (measured) = 0.054 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.91 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 0.072 W/kg
**SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.021 mW/g**
Maximum value of SAR (measured) = 0.052 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.4 degree.C , After 23.4 degree.C




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

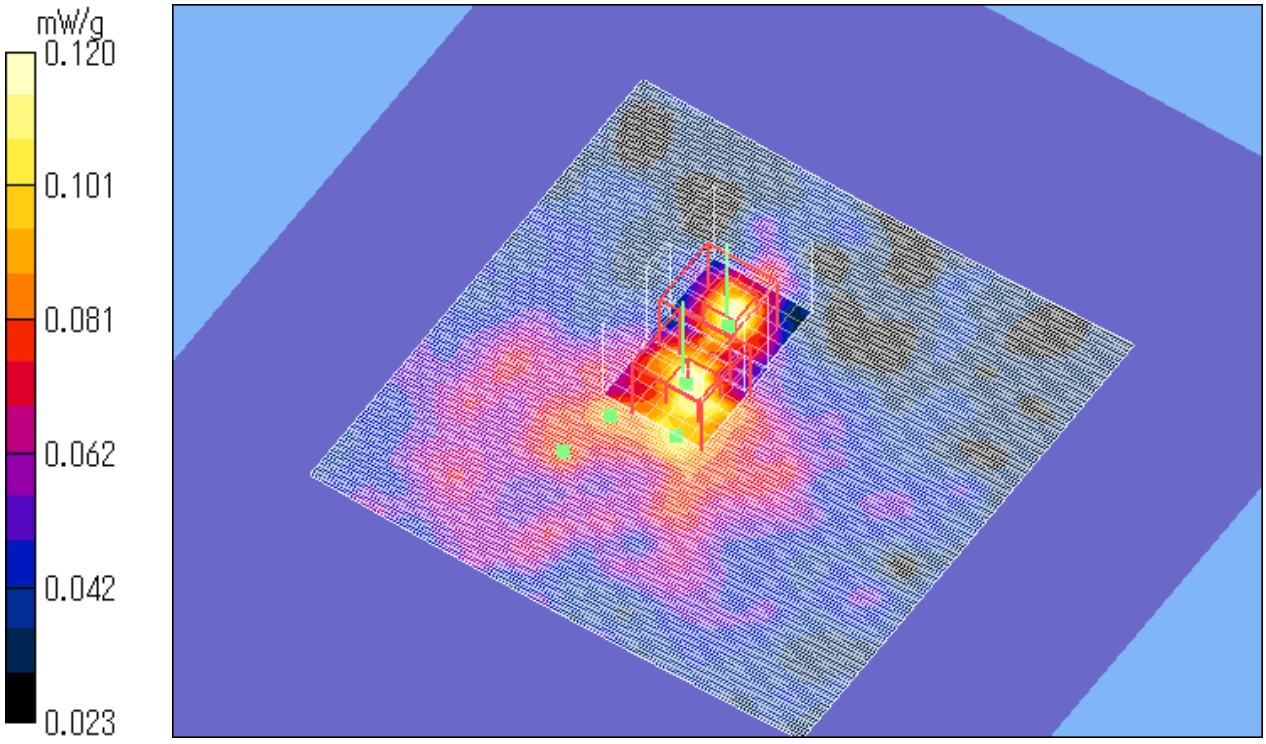
**SX-10WAG/Front（Ant.down）/5260MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (151x81x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.321 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.06 V/m; Power Drift = -0.189 dB
Peak SAR (extrapolated) = 0.533 W/kg
**SAR(1 g) = 0.188 mW/g; SAR(10 g) = 0.098 mW/g**
Maximum value of SAR (measured) = 0.307 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.4 degree.C ， After 23.4 degree.C



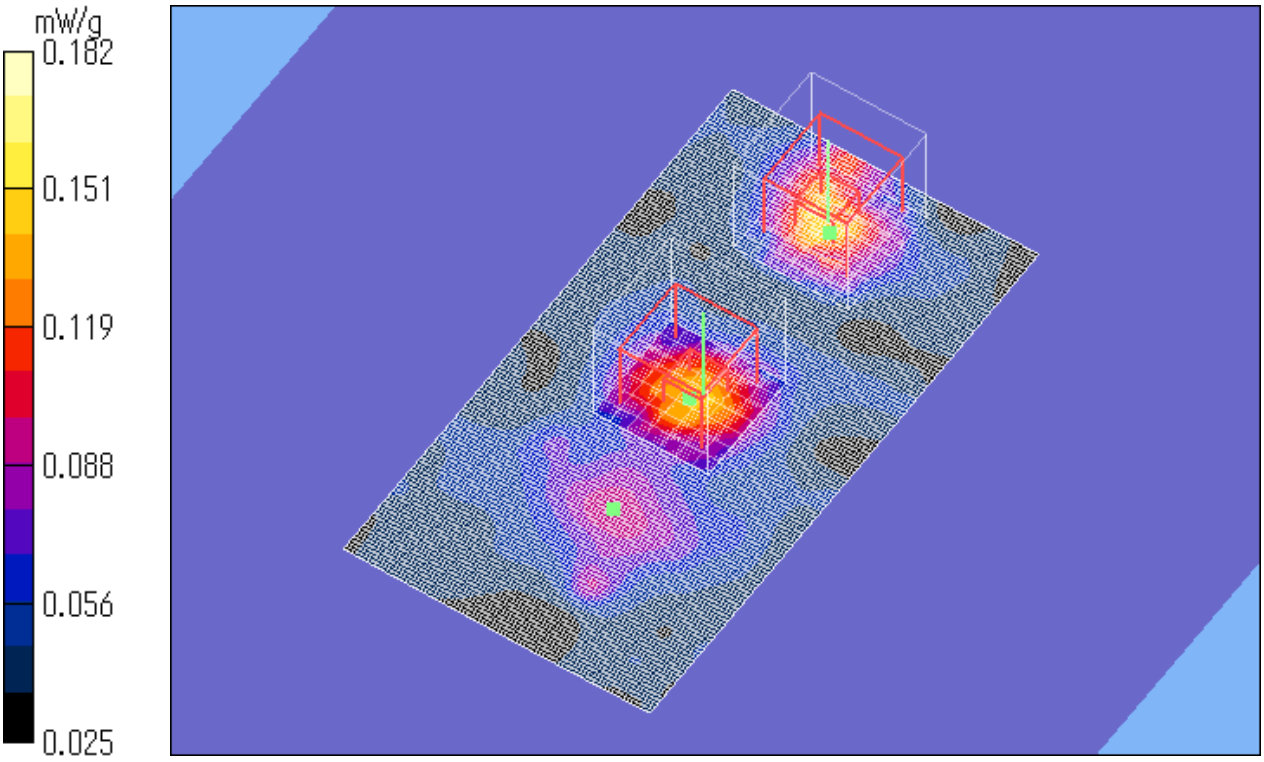
**SX-10WAG/Left Side（Ant.down）/5260MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (151x151x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.127 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 3.23 V/m; Power Drift = -0.116 dB
Peak SAR (extrapolated) = 0.362 W/kg
**SAR(1 g) = 0.085 mW/g; SAR(10 g) = 0.054 mW/g**
Maximum value of SAR (measured) = 0.120 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 3.23 V/m; Power Drift = -0.116 dB
Peak SAR (extrapolated) = 0.325 W/kg
**SAR(1 g) = 0.086 mW/g; SAR(10 g) = 0.059 mW/g**
Maximum value of SAR (measured) = 0.123 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.4 degree.C ， After 23.4 degree.C



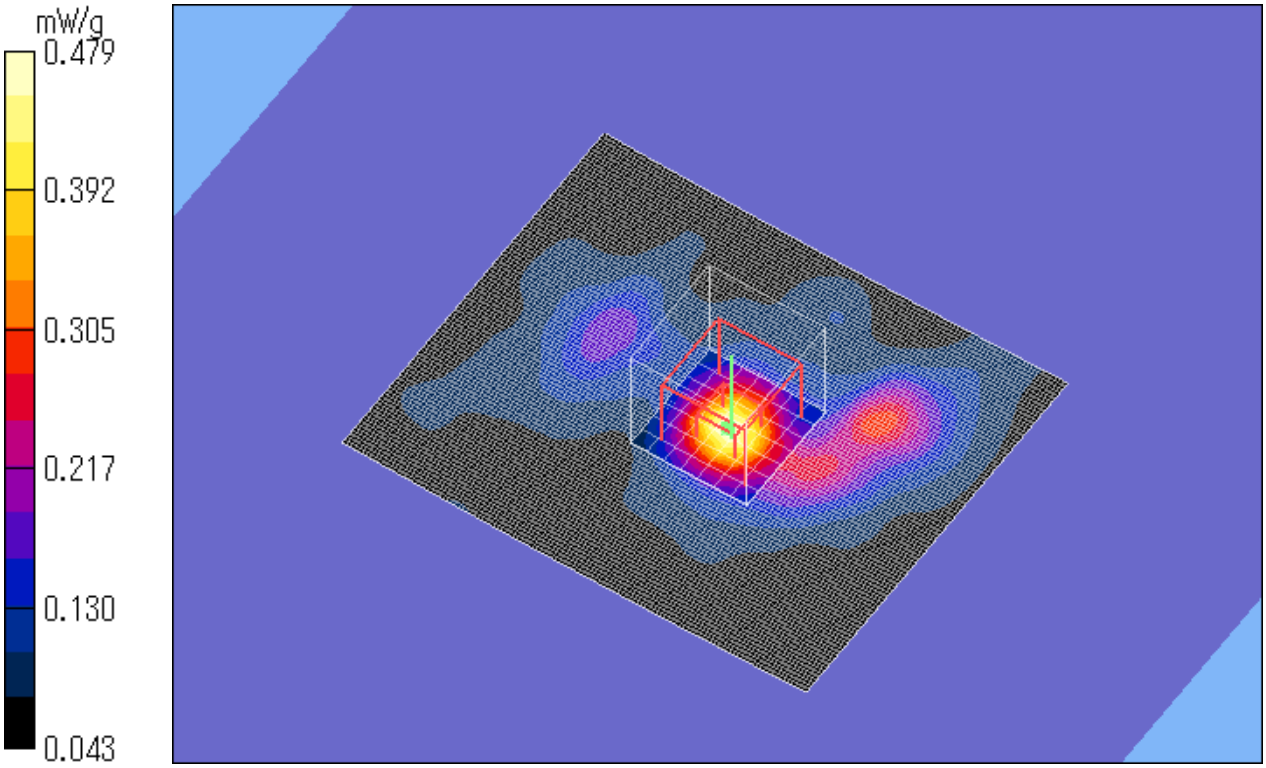
**SX-10WAG/Left Side（Ant.up）/5260MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (81x151x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.153 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.44 V/m; Power Drift = 0.050 dB
Peak SAR (extrapolated) = 0.397 W/kg
**SAR(1 g) = 0.107 mW/g; SAR(10 g) = 0.064 mW/g**
Maximum value of SAR (measured) = 0.182 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.44 V/m; Power Drift = 0.050 dB
Peak SAR (extrapolated) = 0.311 W/kg
**SAR(1 g) = 0.102 mW/g; SAR(10 g) = 0.066 mW/g**
Maximum value of SAR (measured) = 0.153 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.4 degree.C ， After 23.4 degree.C



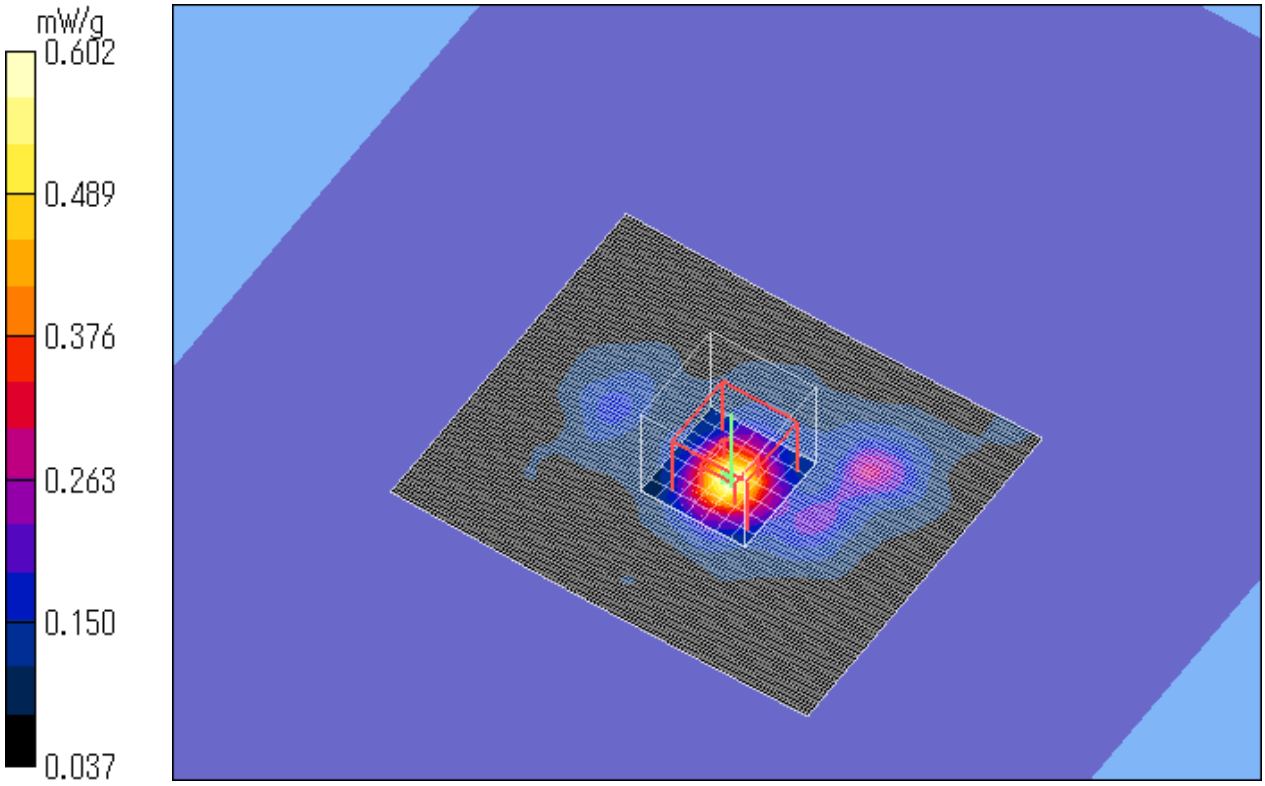
**SX-10WAG/Rear（Ant.down）/5180MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (121x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.500 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 8.69 V/m; Power Drift = -0.080 dB
Peak SAR (extrapolated) = 0.924 W/kg
**SAR(1 g) = 0.293 mW/g; SAR(10 g) = 0.144 mW/g**
Maximum value of SAR (measured) = 0.479 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.4 degree.C ， After 23.4 degree.C



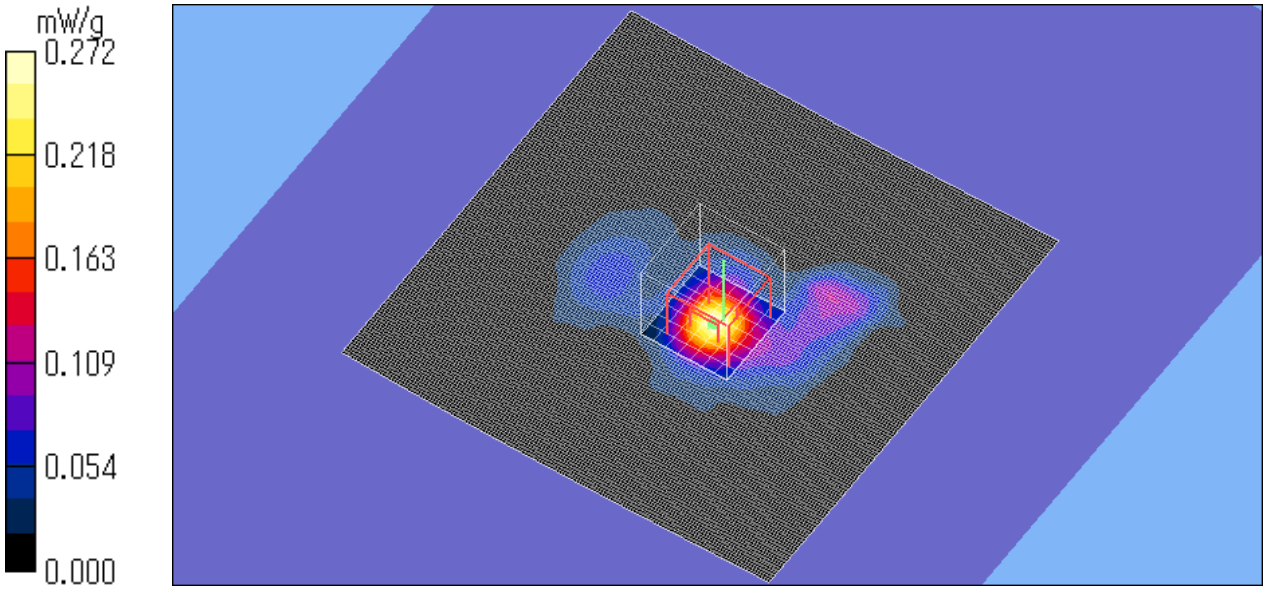
**SX-10WAG/Rear（Ant.down）/5320MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (121x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.576 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.3 V/m; Power Drift = -0.175 dB
Peak SAR (extrapolated) = 1.13 W/kg
**SAR(1 g) = 0.339 mW/g; SAR(10 g) = 0.154 mW/g**
Maximum value of SAR (measured) = 0.602 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.4 degree.C , After 23.4 degree.C



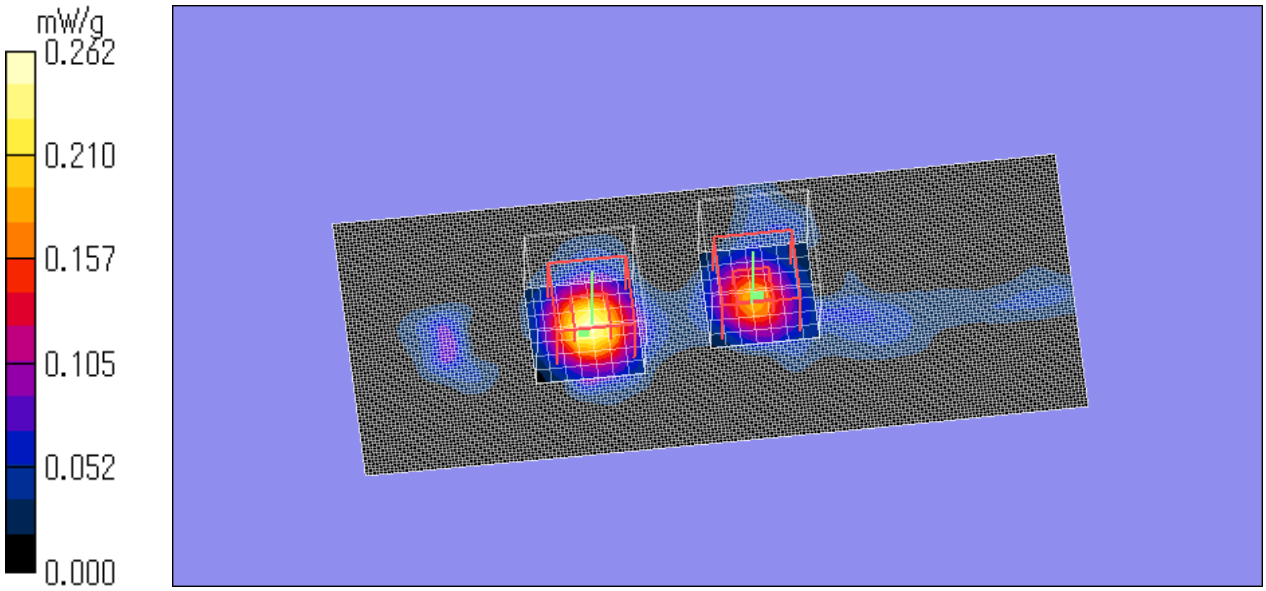
**SX-10WAG/Rear（Ant.down）/5260MHz/11a 16QAM(36Mbps)/with case**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (151x151x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.291 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.71 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 0.508 W/kg
**SAR(1 g) = 0.146 mW/g; SAR(10 g) = 0.050 mW/g**
Maximum value of SAR (measured) = 0.272 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.3 degree.C , After 23.3 degree.C



**SX-10WAG/Rear（Ant.up）/5260MHz/11a 16QAM(36Mbps)/with case**

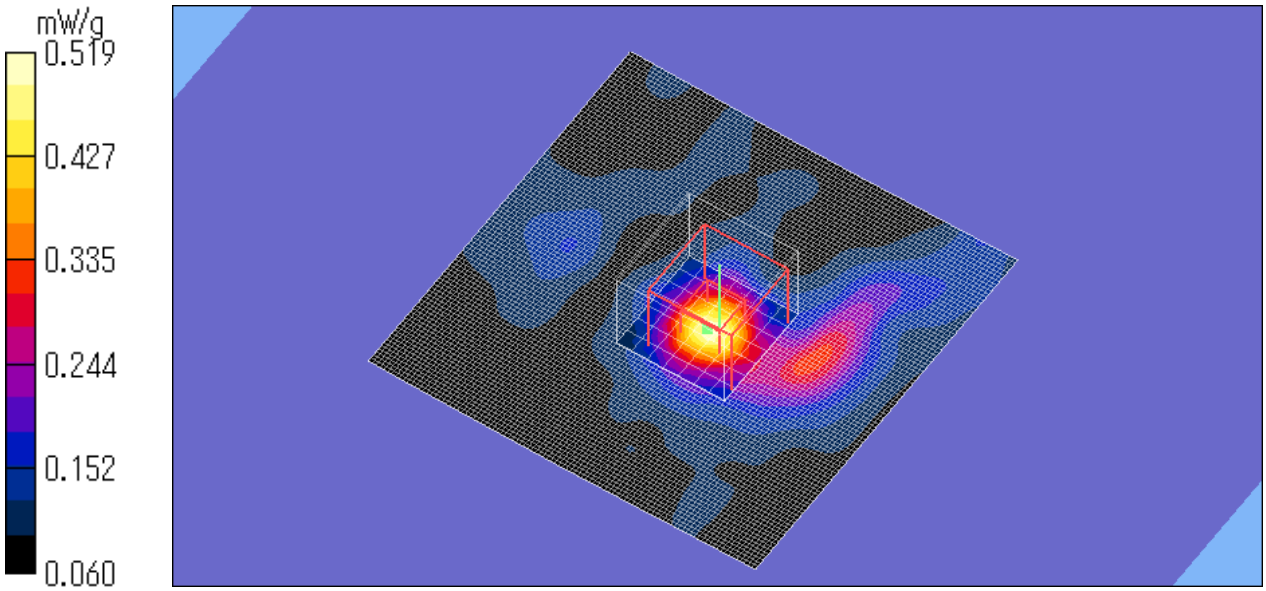
Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (81x201x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.287 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 3.67 V/m; Power Drift = -0.132 dB
Peak SAR (extrapolated) = 0.435 W/kg
**SAR(1 g) = 0.135 mW/g; SAR(10 g) = 0.046 mW/g**
Maximum value of SAR (measured) = 0.262 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 3.67 V/m; Power Drift = -0.132 dB
Peak SAR (extrapolated) = 0.397 W/kg
**SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.033 mW/g**
Maximum value of SAR (measured) = 0.199 mW/g
Test Date = 08/08/07
Ambient Temperature = 23.5 degree.c
Liquid Temperature = Before 23.3 degree.C ， After 23.3 degree.C



**3. SAR measurement data (11a High band)**

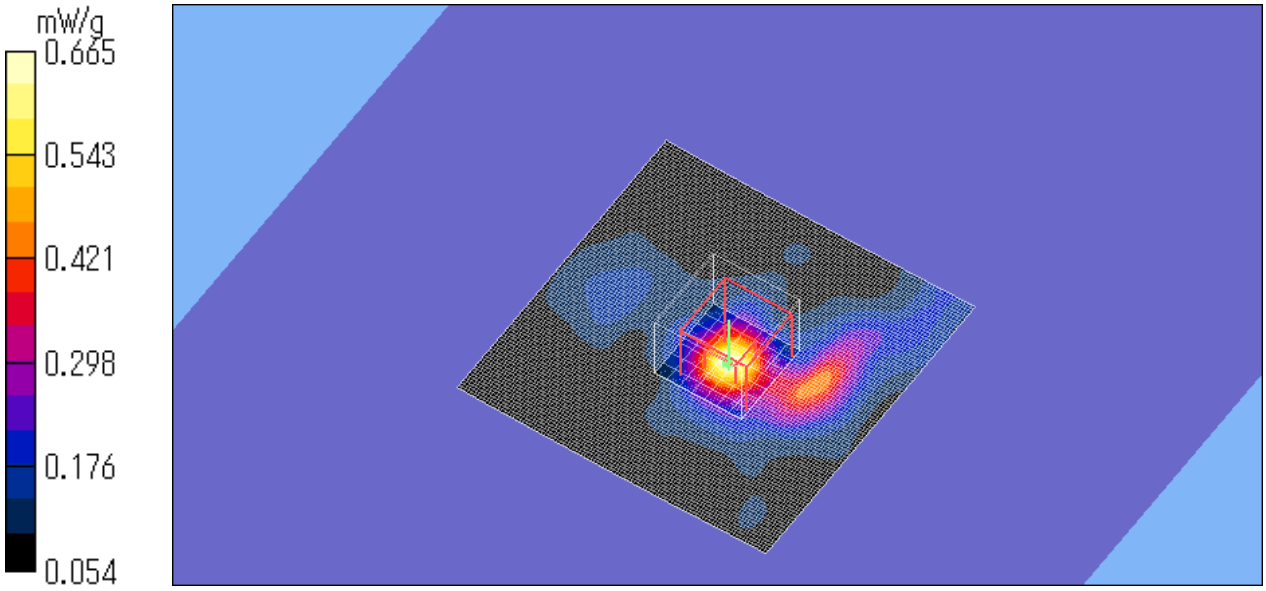
**SX-10WAG/Rear（Ant.down）/5765MHz/11a BPSK(9Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.562 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 9.49 V/m; Power Drift = -0.186 dB
Peak SAR (extrapolated) = 1.22 W/kg
**SAR(1 g) = 0.314 mW/g; SAR(10 g) = 0.160 mW/g**
Maximum value of SAR (measured) = 0.519 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.7 degree.C ， After 24.0 degree.C



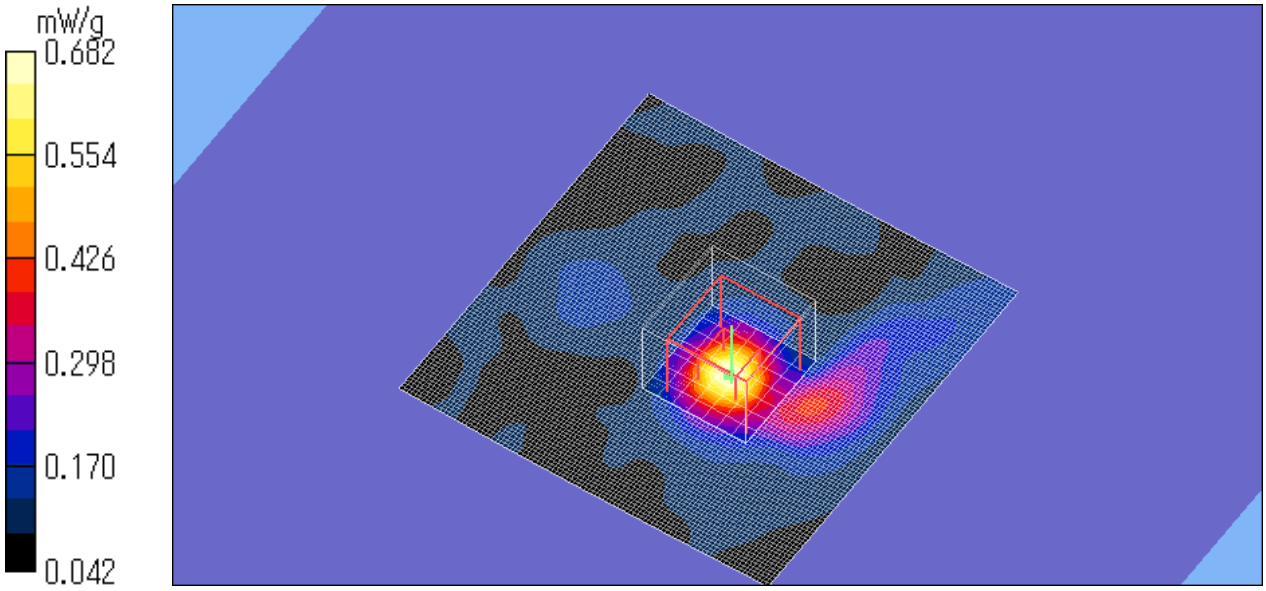
**SX-10WAG/Rear（Ant.down）/5765MHz/11a QPSK(18Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.745 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.8 V/m; Power Drift = -0.188 dB
Peak SAR (extrapolated) = 1.51 W/kg
**SAR(1 g) = 0.391 mW/g; SAR(10 g) = 0.180 mW/g**
Maximum value of SAR (measured) = 0.665 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C , After 24.0 degree.C



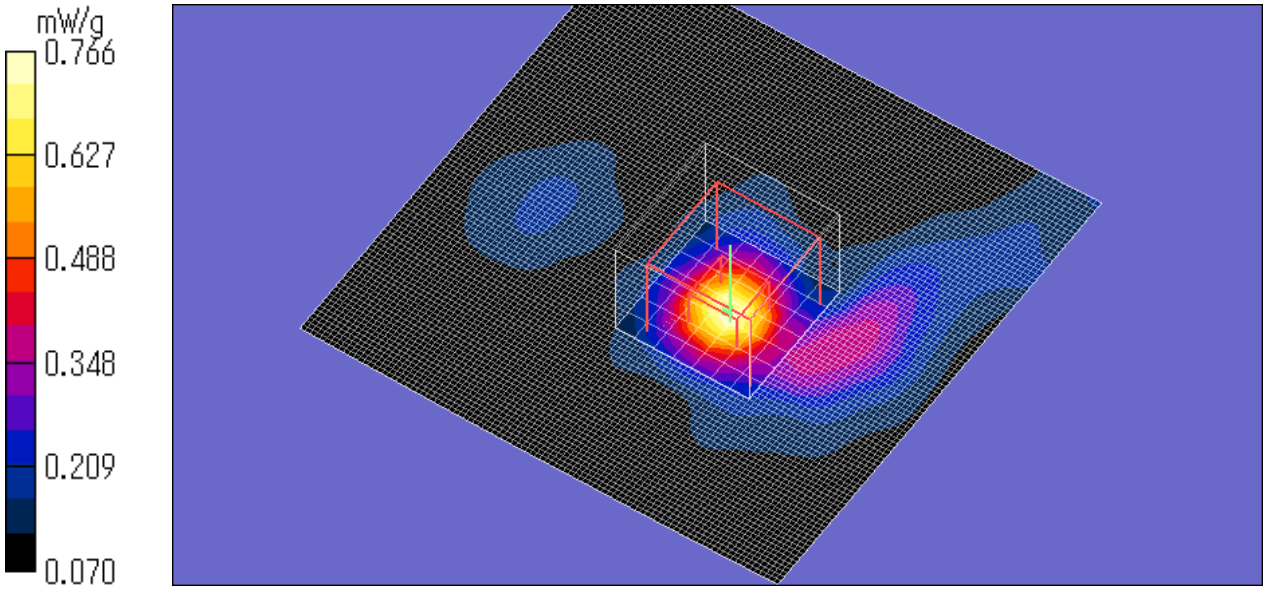
**SX-10WAG/Rear（Ant.down）/5765MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.727 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 7.90 V/m; Power Drift = 0.054 dB
Peak SAR (extrapolated) = 1.58 W/kg
**SAR(1 g) = 0.409 mW/g; SAR(10 g) = 0.190 mW/g**
Maximum value of SAR (measured) = 0.682 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C ， After 24.0 degree.C



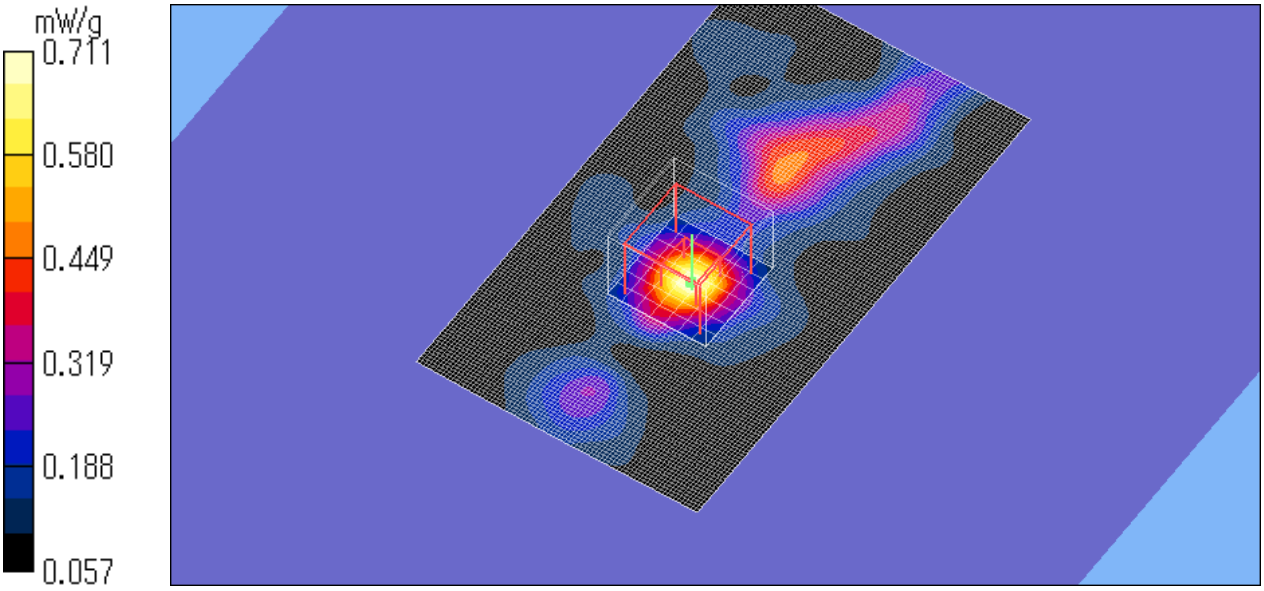
**SX-10WAG/Rear（Ant.down）/5765MHz/11a 64QAM(54Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.756 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 7.93 V/m; Power Drift = -0.167 dB
Peak SAR (extrapolated) = 1.57 W/kg
**SAR(1 g) = 0.439 mW/g; SAR(10 g) = 0.203 mW/g**
Maximum value of SAR (measured) = 0.766 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C , After 24.0 degree.C



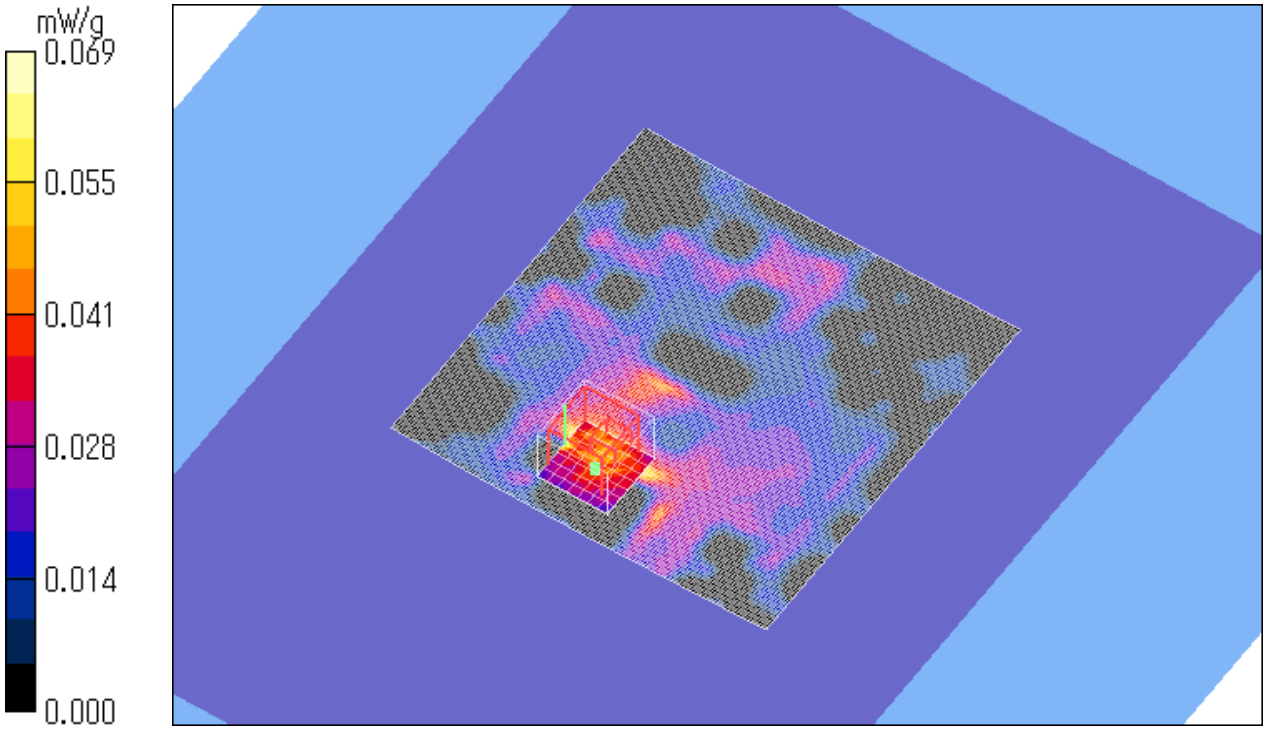
**SX-10WAG/Rear（Ant.up）/5765MHz/11a 64QAM(54Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (81x141x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.765 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 6.37 V/m; Power Drift = 0.092 dB
Peak SAR (extrapolated) = 1.43 W/kg
**SAR(1 g) = 0.416 mW/g; SAR(10 g) = 0.200 mW/g**
Maximum value of SAR (measured) = 0.711 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C ， After 23.7 degree.C



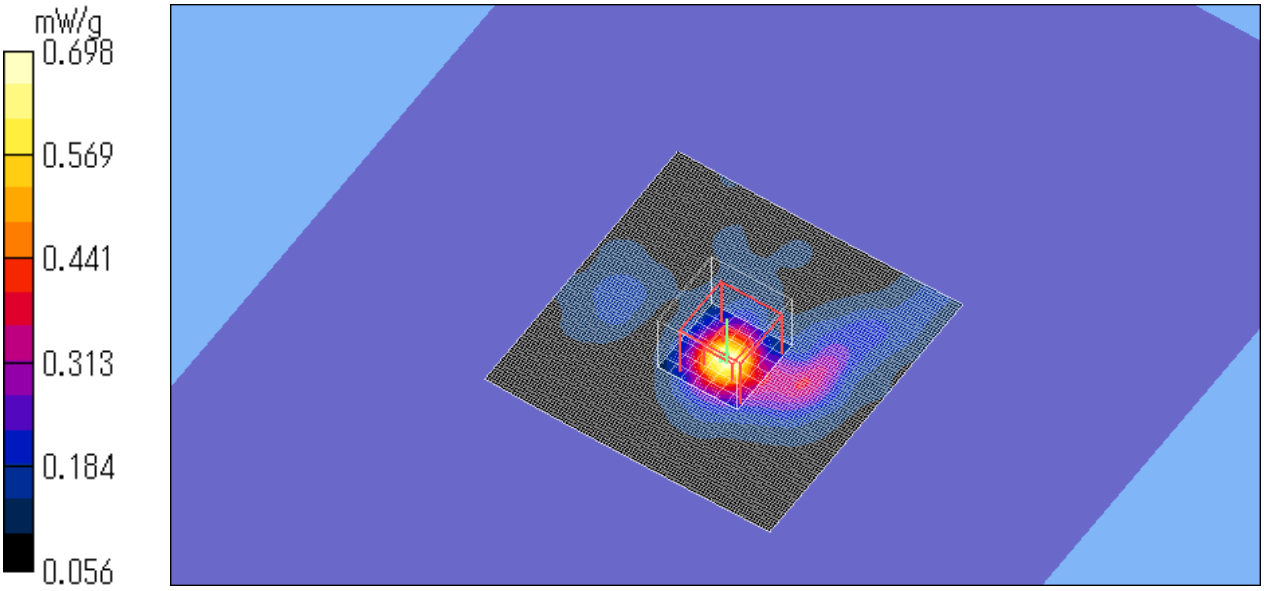
**SX-10WAG/Right Side（Ant.down）/5765MHz/11a 64QAM(54Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (151x151x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.144 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 1.30 V/m; Power Drift = -0.195 dB
Peak SAR (extrapolated) = 0.292 W/kg
**SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.00617 mW/g**
Maximum value of SAR (measured) = 0.069 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C ， After 24.0 degree.C



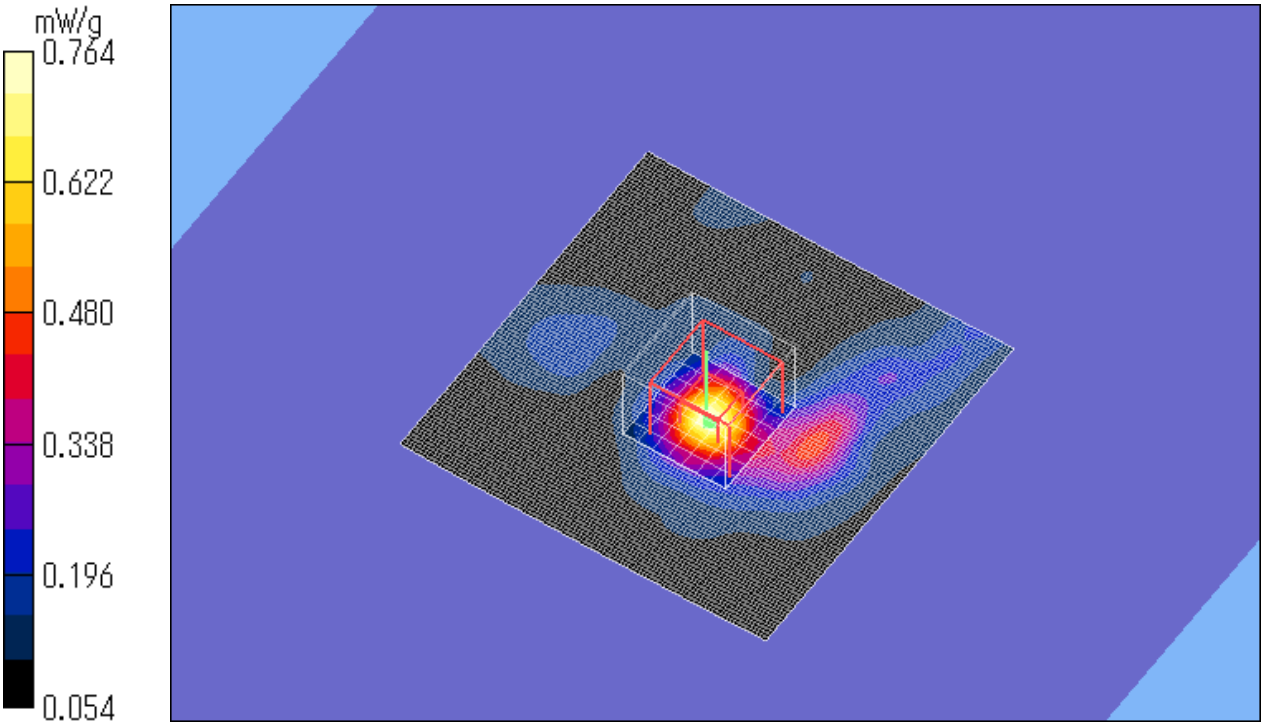
**SX-10WAG/Rear（Ant.down）/5745MHz/11a 64QAM(54Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.715 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 9.75 V/m; Power Drift = -0.153 dB
Peak SAR (extrapolated) = 1.42 W/kg
**SAR(1 g) = 0.406 mW/g; SAR(10 g) = 0.193 mW/g**
Maximum value of SAR (measured) = 0.698 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.5 degree.C , After 23.5 degree.C



**SX-10WAG/Rear（Ant.down）/5825MHz/11a 64QAM(54Mbps)**

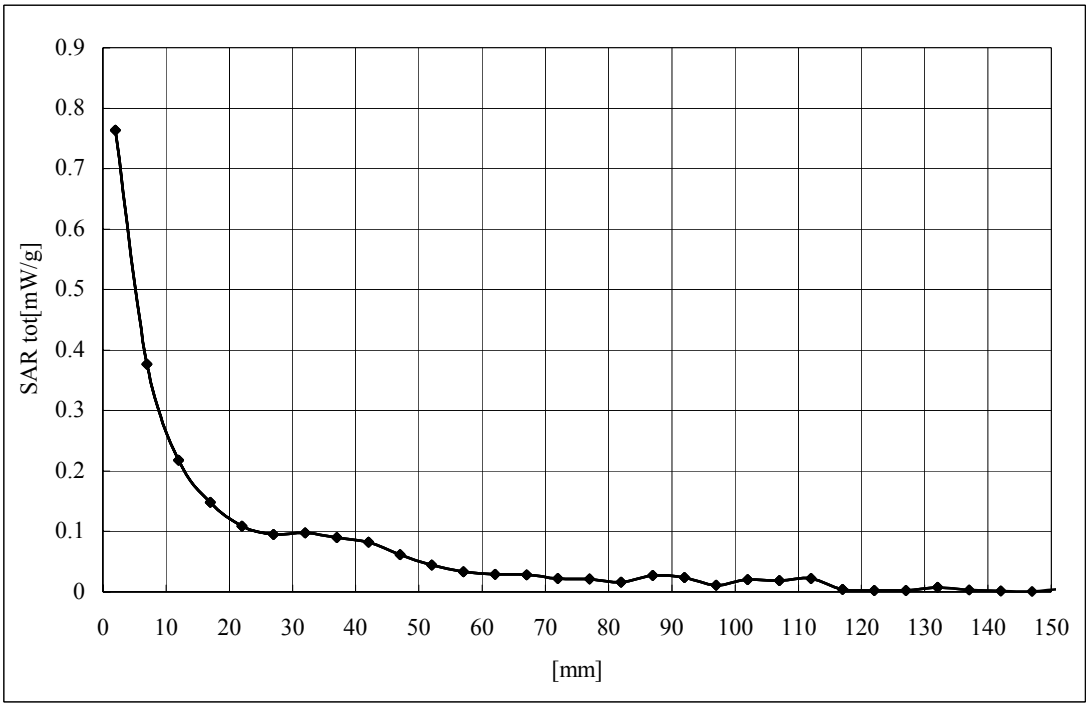
Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.861 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.7 V/m; Power Drift = -0.185 dB
Peak SAR (extrapolated) = 1.78 W/kg
**SAR(1 g) = 0.450 mW/g; SAR(10 g) = 0.206 mW/g**
Maximum value of SAR (measured) = 0.764 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.5 degree.C ， After 23.5 degree.C



**Z-axis scan at max SAR location**

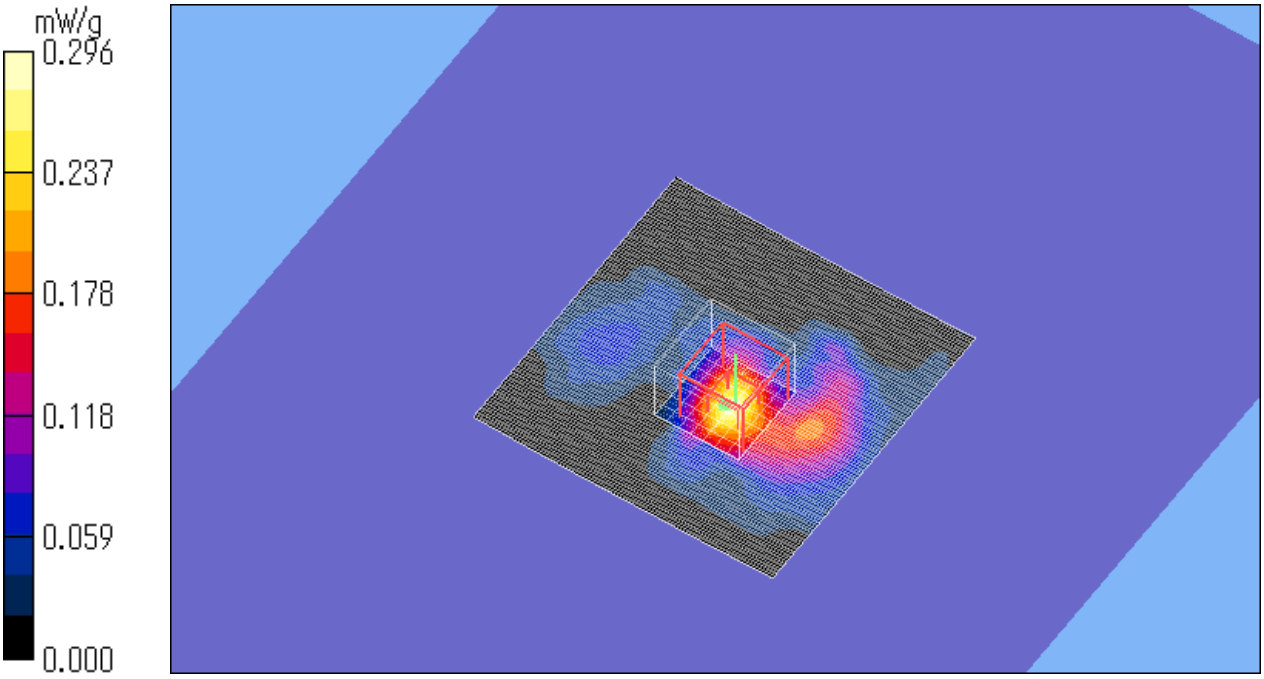
**SX-10WAG/Rear（Ant.down）/5825MHz/11a 64QAM(54Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160



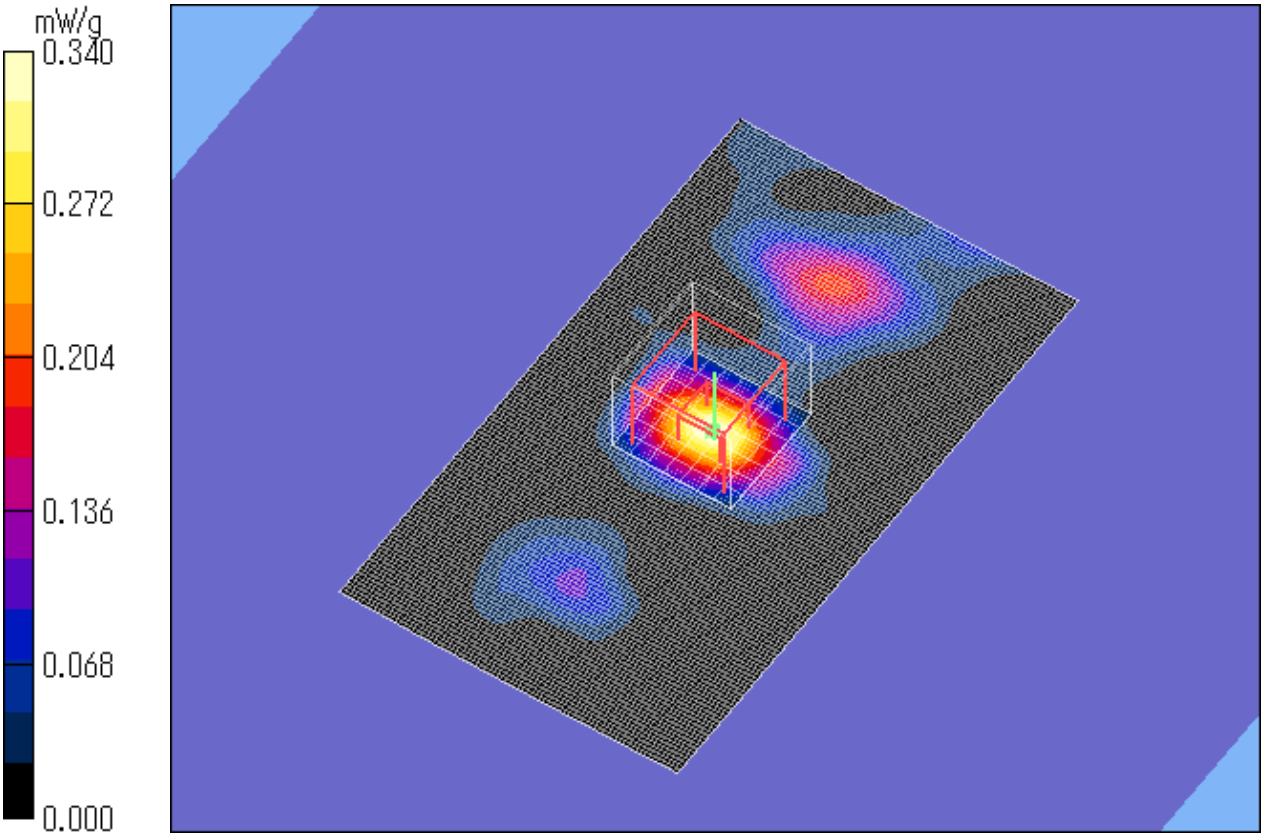
**SX-10WAG/Rear（Ant.down）/5825MHz/11a 64QAM(54Mbps)/with case**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.339 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 6.76 V/m; Power Drift = -0.129 dB
Peak SAR (extrapolated) = 0.625 W/kg
**SAR(1 g) = 0.151 mW/g; SAR(10 g) = 0.056 mW/g**
Maximum value of SAR (measured) = 0.296 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.5 degree.C , After 23.5 degree.C



**SX-10WAG/Rear（Ant.up）/5825MHz/11a 64QAM(54Mbps)/with case**

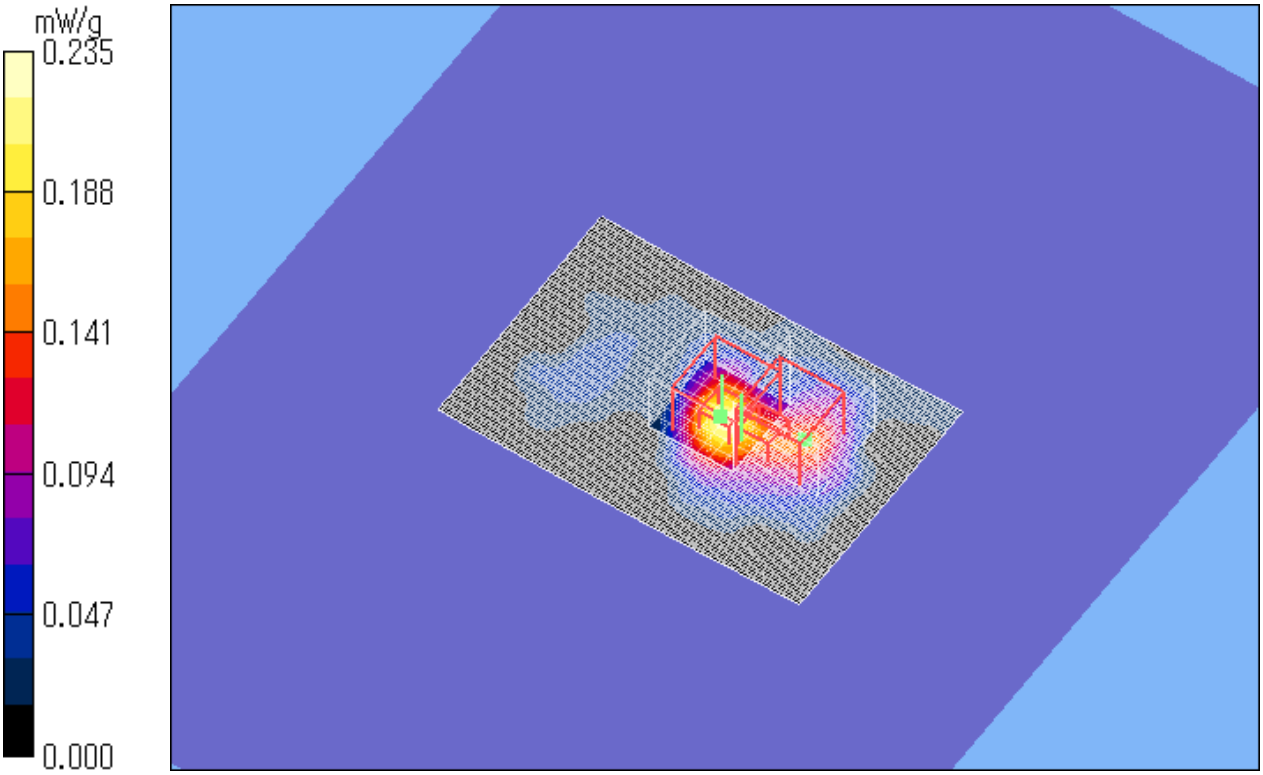
Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (81x141x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.363 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 7.55 V/m; Power Drift = -0.186 dB
Peak SAR (extrapolated) = 0.642 W/kg
**SAR(1 g) = 0.175 mW/g; SAR(10 g) = 0.059 mW/g**
Maximum value of SAR (measured) = 0.340 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.5 degree.C , After 23.5 degree.C



**SX-10WAG/Rear（Ant.down）/5825MHz/11a 64QAM(54Mbps)/separation 15mm**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

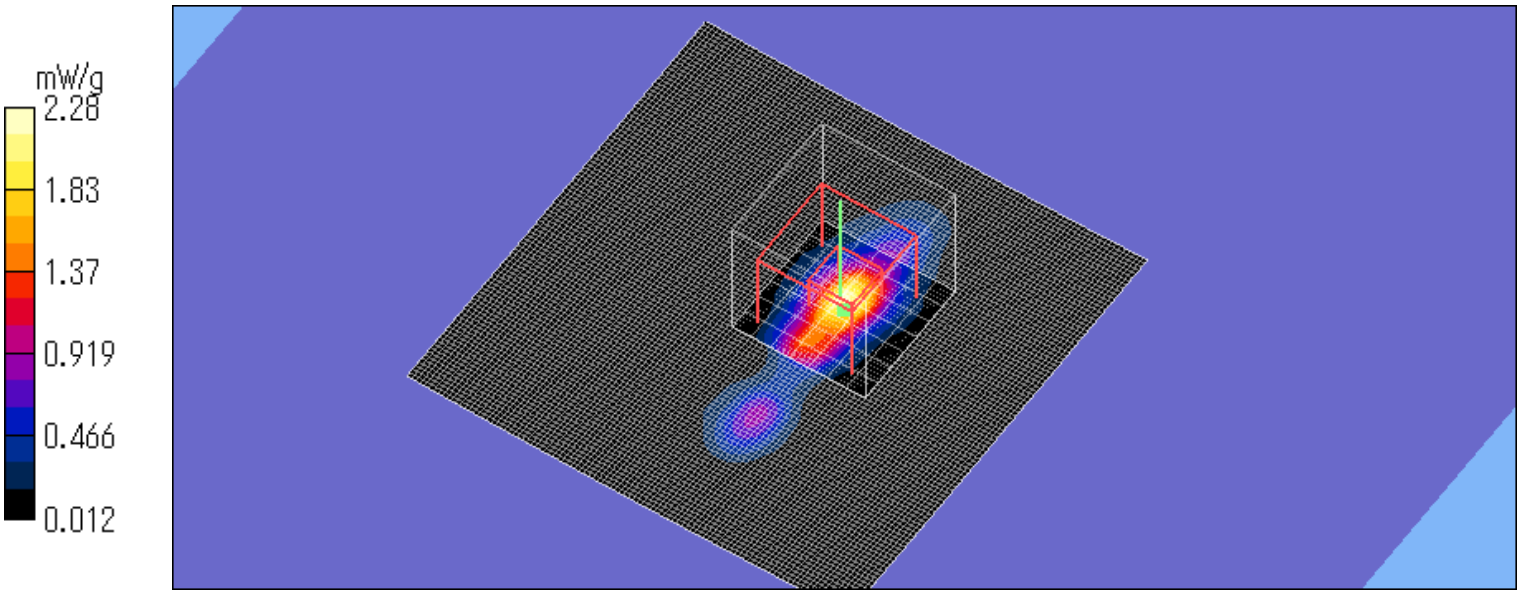
**Area Scan (121x81x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.234 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.45 V/m; Power Drift = 0.094 dB
Peak SAR (extrapolated) = 0.498 W/kg
**SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.045 mW/g**
Maximum value of SAR (measured) = 0.235 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 5.45 V/m; Power Drift = 0.094 dB
Peak SAR (extrapolated) = 0.375 W/kg
**SAR(1 g) = 0.085 mW/g; SAR(10 g) = 0.035 mW/g**
Maximum value of SAR (measured) = 0.180 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.5 degree.C ， After 23.5 degree.C



**4. Reference data (11a Low and High band)**

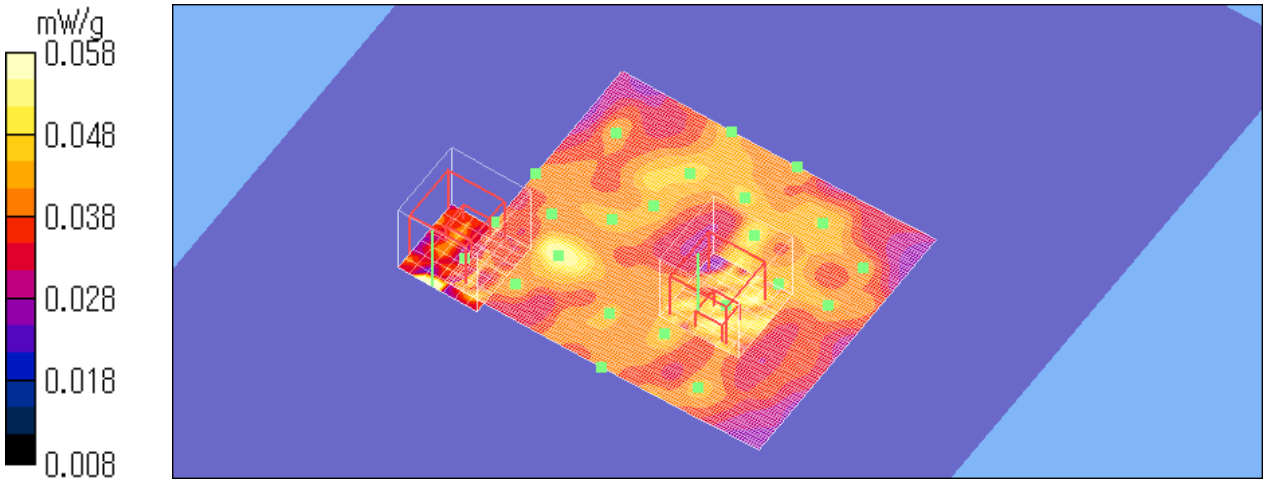
**SX-10WAG/Top（Ant.down）/5260MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.09 mho/m; $\varepsilon_r$ = 44.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.69 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 11.4 V/m; Power Drift = 0.163 dB
Peak SAR (extrapolated) = 5.05 W/kg
**SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.325 mW/g**
Maximum value of SAR (measured) = 2.28 mW/g
Test Date = 08/30/07
Ambient Temperature = 25.0 degree.c
Liquid Temperature = Before 24.5 degree.C ， After 24.5 degree.C



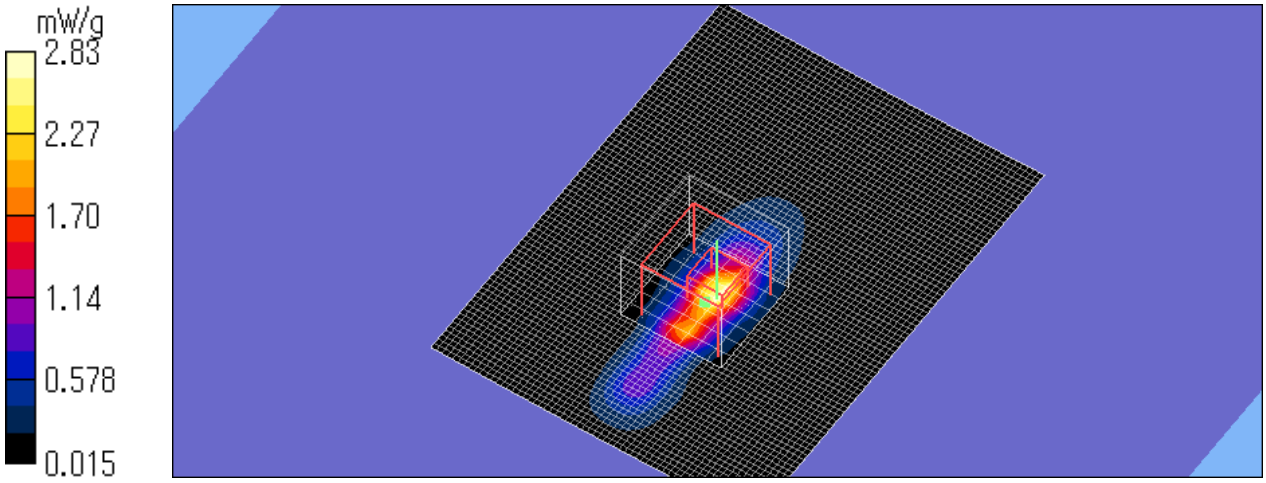
**SX-10WAG/Top（Ant.up）/5260MHz/11a 16QAM(36Mbps)**

Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.09 mho/m; $\varepsilon_r$ = 44.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (121x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.060 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.85 V/m; Power Drift = -0.173 dB
Peak SAR (extrapolated) = 0.186 W/kg
**SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.016 mW/g**
Maximum value of SAR (measured) = 0.090 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.85 V/m; Power Drift = -0.173 dB
Peak SAR (extrapolated) = 0.140 W/kg
**SAR(1 g) = 0.038 mW/g; SAR(10 g) = 0.023 mW/g**
Maximum value of SAR (measured) = 0.058 mW/g
Test Date = 08/30/07
Ambient Temperature = 25.0 degree.c
Liquid Temperature = Before 24.5 degree.C ， After 24.5 degree.C



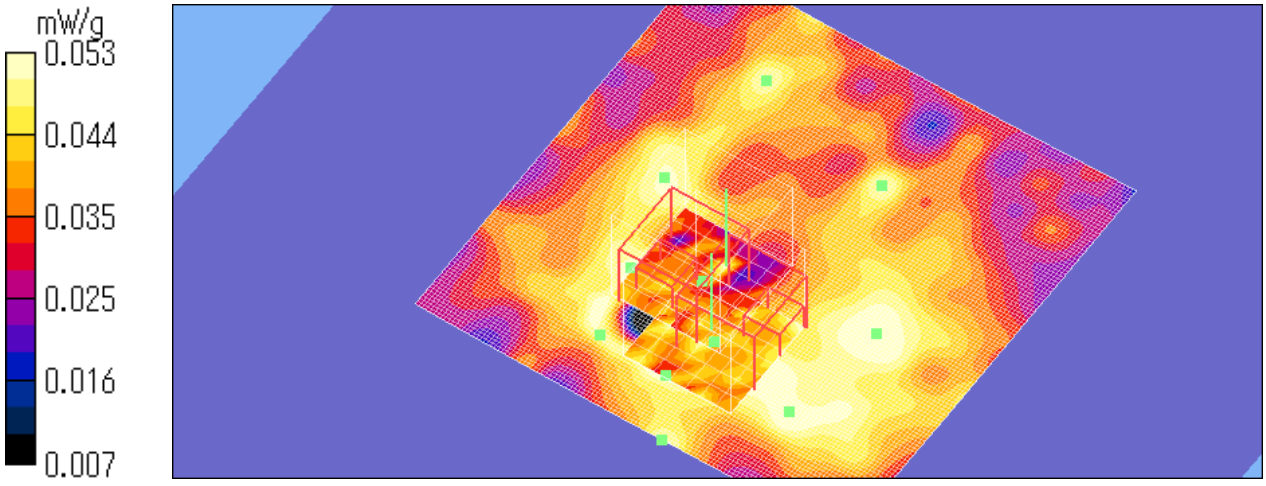
**SX-10WAG/Top（Ant.down）/5765MHz/11a 64QAM(54Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6 mho/m; $\varepsilon_r$ = 48.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.26 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 8.48 V/m; Power Drift = 0.009 dB
Peak SAR (extrapolated) = 7.52 W/kg
**SAR(1 g) = 1.42 mW/g; SAR(10 g) = 0.403 mW/g**
Maximum value of SAR (measured) = 2.83 mW/g
Test Date = 08/30/07
Ambient Temperature = 25.0 degree.c
Liquid Temperature = Before 24.5 degree.C , After 24.5 degree.C



**SX-10WAG/Top（Ant.up）/5765MHz/11a 64QAM(54Mbps)**

Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6 mho/m; $\varepsilon_r$ = 48.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
**Area Scan (121x121x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.075 mW/g
**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.42 V/m; Power Drift = -0.194 dB
Peak SAR (extrapolated) = 0.106 W/kg
**SAR(1 g) = 0.035 mW/g; SAR(10 g) = 0.025 mW/g**
Maximum value of SAR (measured) = 0.055 mW/g
**Zoom Scan (8x8x11)/Cube 1:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.42 V/m; Power Drift = -0.194 dB
Peak SAR (extrapolated) = 0.148 W/kg
**SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.020 mW/g**
Maximum value of SAR (measured) = 0.053 mW/g
Test Date = 08/30/07
Ambient Temperature = 25.0 degree.c
Liquid Temperature = Before 24.5 degree.C ， After 24.5 degree.C



# APPENDIX 3 : Test instruments

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

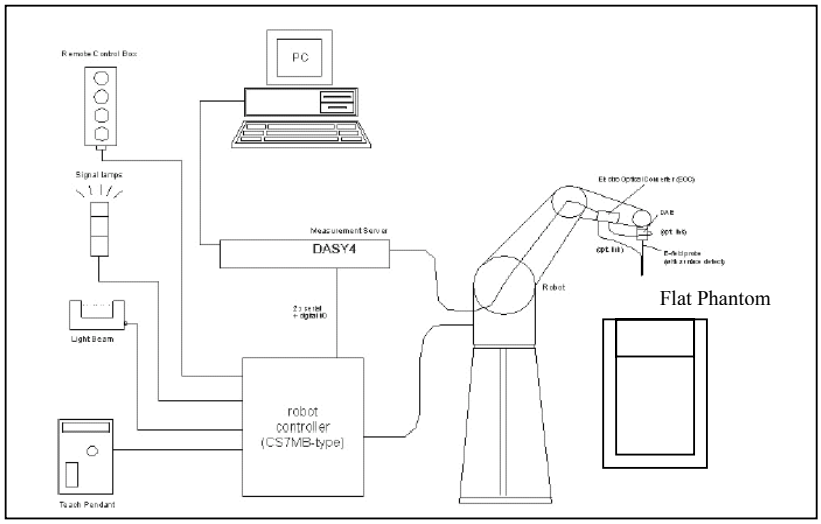
## 1. Equipment used

| Control No. | Name of Equipment | Manufacture | Model number | Serial number | Calibration | |
|---|---|---|---|---|---|---|
| | | | | | Last Cal | due date |
| MPM-08 | Power Meter | Anritsu | ML2495A | 6K00003338 | 2006/09/20 | 2007/09/30 |
| MPSE-11 | Power sensor | Anritsu | MA2411B | 011737 | 2006/09/20 | 2007/09/30 |
| MCC-06 | Microwave Cable 1G-26.5GHz 1m | Suhner | SUCOFLEX 104 | 233011/4 | 2007/02/26 | 2008/02/29 |
| MAT-20 | Attenuator(10dB)(above1GHz) | HIROSE ELECTRIC CO.,LTD. | AT-110 | - | 2007/01/11 | 2008/01/31 |
| MRENT-52 | 5GHz System Validation Dipole | Schmid&Partner Engineering AG | D5GHzV2 | 1039 | 2006/02/10 | 2008/02/29 |
| MPM-01 | Power Meter | Agilent | 8449B | 3008A01671 | 2007/02/15 | 2008/02/29 |
| MPSE-01 | Power sensor | Agilent | E9300B | US40010300 | 2006/12/20 | 2007/12/31 |
| MPSE-03 | Power sensor | Agilent | E9327A | US40440576 | 2007/01/10 | 2008/01/31 |
| MSG-01 | Signal Genelator | Rohde & Schwarz | SMR40 | 100023 | 2007/01/18 | 2008/01/31 |
| MAT-15 | Attenuator(30dB) | Agilent | US40010300 | 08498-60012 | 2006/12/20 | 2007/12/31 |
| MRFA-08 | Pre Amplifier | TSJ | TCBP0206 | - | 2007/03/02 | 2008/03/31 |
| MHDC-12 | Directional Coupler | Hewlett Packard | 772D | 2839A0016 | - | - |
| MNA-01 | Network Analyzer | Agilent | E8358A | US41080381 | 2006/02/10 | 2009/02/28 |
| MPB-03 | Dosimetric E-Field Probe | Schmid&Partner Engineering AG | EX3DV3 | 3507 | 2007/06/15 | 2008/06/30 |
| MDAE-01 | Data Acquisition Electronics | Schmid&Partner Engineering AG | DAE3 V1 | 509 | 2007/06/13 | 2008/06/30 |
| MSTW-16 | SAR measurement System | Schmid&Partner Engineering AG | DASY4 | I021834 | - | - |
| MPF-01 | Flat Phantom | Schmid&Partner Engineering AG | 2.0mm Flat Phantom V4.3L | 1005 | - | - |
| MDPK-01 | Dielectric probe kit | Agilent | 85070D | - | - | - |
| MOS-05 | Thermo-Hygrometer | Custom | CTH-190 | 810201 | 2006/04/25 | 2008/04/30 |
| MOS-10 | Digtal thermometer | HANNA | Checktemp-2 | MOS-10 | 2007/03/23 | 2009/03/31 |
| - | Body 5800MHz | - | - | - | Daily check | Target value ± 5% |
| - | SAR room | - | - | - | Daily check | Ambient Noise<0.012W/kg |

**2. Dosimetry assessment setup**

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

**3. Configuration and peripherals**




The 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 2000.

8. DASY4 software.

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

10. The Flat phantom enabling testing of body.

11. The device holder for EUT.(Palette)

12. Tissue simulating liquid mixed according to the given recipes.

13. Validation dipole kits allowing to validate the proper functioning of the system.

**4. System components**

**4-a EX3DV3 Probe Specification**

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

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

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

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

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

**EX3DV3 E-field Probe**

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

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

## 4-b 2mm Flat phantom

**Construction:**
2mm Flat phantom V4.3L enables the dosimetric evaluation of body mounted.
A cover prevents evaporatuin 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:
Central region : 2 +/-0.2mm
Circumference region : 6 +/-0.2mm

Dimensions:
Inside (H x L x W) : 180 x 800 x 420 mm
Central region (L x W ) : 650 x 250mm

**2mm Flat phantom V4.3L**

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

**5. Test system specifications**

**Robot RX60L**

| | | |
|---|---|---|
| **Number of Axes** | : | 6 |
| **Payload** | : | 1.6 kg |
| **Reach** | : | 800mm |
| **Repeatability** | : | +/-0.025mm |
| **Control Unit** | : | CS7M |
| **Programming Language** | : | V+ |
| **Manuafacture** | : | Stäubli Unimation Corp. Robot Model: RX60 |

**DASY4 Measurement server**

| | | |
|---|---|---|
| **Features:** | : | 166MHz low power Pentium MMX 32MB chipdisk and 64MB RAM<br>Serial link to DAE (with watchdog supervision)<br>16 Bit A/D converter for surface detection system<br>Two serial links to robot (one for real-time communication which is supervised by watchdog)<br>Ethernet link to PC (with watchdog supervision)<br>Emergency stop relay for robot safety chainTwo expansion slots for future applications |
| **Manufacture** | : | Schimid & Partner Engineering AG |

**Data Acquisition Electronic (DAE)**

| | | |
|---|---|---|
| **Features** | : | Signal amplifier, multiplexer, A/D converter and control logic<br>Serial optical link for communication with DASY4 embedded system (fully remote controlled) 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version) |
| **Measurement Range** | : | 1 µV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV) |
| **Input Offset voltage** | : | < 1 µV (with auto zero) |
| **Input Resistance** | : | 200 MΩ |
| **Battery Power** | : | > 10 h of operation (with two 9 V battery) |
| **Dimension** | : | 60 x 60 x 68 mm |
| **Manufacture** | : | Schimid & Partner Engineering AG |

**Software**

| | | |
|---|---|---|
| **Item** | : | Dosimetric Assesment System DASY4 |
| **Type No.** | : | SD 000 401A, SD 000 402A |
| **Software version No.** | : | 4.6 |
| **Manufacture / Origin** | : | Schimid & Partner Engineering AG |

**E-Field Probe**

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

**Phantom**

| | | |
|---|---|---|
| **Type** | : | 2mm Flat phantom V4.3L |
| **Shell Material** | : | Fiberglass |
| **Shell Thickness** | : | Central region : 2 +/-0.2mm |
| | | Circumference region : 6 +/-0.2mm |
| **Dimensions** | : | Inside (H x L x W) : 180 x 800 x 420 mm |
| | | Central region (L x W ) : 650 x 250mm |
| **Manufacture** | : | Schimid & Partner Engineering AG |

**6. Simulated Tissues Composition of 5GHz**

| Ingredient | MiXTURE(%) | |
|---|---|---|
| | Head 5800MHz | Muscle 5800MHz |
| Water | 64.0 | 78.0 |
| Mineral Oil | 18.0 | 11.0 |
| Emulsifiers | 15.0 | 9.0 |
| Additives and salt | 3.0 | 2.0 |

**7. Validation Measurement**
**Simulated tissue liquid parameter**

**7-a Simulated Tissue Liquid Parameter confirmation**

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

**7-b Body 5GHz**

Type of liquid : **Muscle 5GHz**
Ambient temperature (deg.c.) : **24.5(8-August), 24.5(9-August),25.0 (30-August)**
Relative Humidity (%) : **60(8-August), 52(9-August),56 (30-August)**
Liquid depth (cm) : **15.0**

| DIELECTRIC PARAMETERS MEASUREMENT RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Date | Frequency | Liquid Temp [deg.c] | | Parameters | Target Value | Measured | Deviation [%] | Limit [%] |
| | | Before | After | | | | | |
| 8-Aug | 5200 | 23.3 | 23.3 | Relative Permittivity εr *1 | 49.0 | 46.7 | -4.7 | +/-5 |
| | | | | Coductivity σ [mho/m] *1 | 5.30 | 5.46 | 3.0 | +/-5 |
| 8-Aug | 5200 | 23.3 | 23.3 | Relative Permittivity εr *2 | 49.1 | 46.7 | -4.9 | +/-10 |
| | | | | Coductivity σ [mho/m] *2 | 5.11 | 5.46 | 6.8 | +/-10 |
| 9-Aug | 5800 | 23.7 | 23.7 | Relative Permittivity εr *1 | 48.2 | 46.7 | -3.1 | +/-5 |
| | | | | Coductivity σ [mho/m] *1 | 6.00 | 6.27 | 4.5 | +/-5 |
| 9-Aug | 5800 | 23.7 | 23.7 | Relative Permittivity εr *2 | 47.8 | 46.7 | -2.3 | +/-10 |
| | | | | Coductivity σ [mho/m] *2 | 5.88 | 6.27 | 6.6 | +/-10 |
| 30-Aug | 5200 | 24.5 | 24.5 | Relative Permittivity εr *1 | 49.0 | 47.1 | -3.9 | +/-5 |
| | | | | Coductivity σ [mho/m] *1 | 5.30 | 5.09 | -4.0 | +/-5 |
| 30-Aug | 5200 | 24.5 | 24.5 | Relative Permittivity εr *2 | 49.1 | 47.1 | -4.1 | +/-10 |
| | | | | Coductivity σ [mho/m] *2 | 5.11 | 5.09 | -0.4 | +/-10 |
| 30-Aug | 5800 | 24.5 | 24.5 | Relative Permittivity εr *1 | 48.2 | 48.2 | 0.0 | +/-5 |
| | | | | Coductivity σ [mho/m] *1 | 6.00 | 6.00 | 0.0 | +/-5 |
| 30-Aug | 5800 | 24.5 | 24.5 | Relative Permittivity εr *2 | 47.8 | 48.2 | 0.8 | +/-10 |
| | | | | Coductivity σ [mho/m] *2 | 5.88 | 6.00 | 2.0 | +/-10 |

*1 The target values is a parameter defined in FCC OET 65.
*2 The target value is the calibrated dipole TSL parameters. (D5GHzV2,S/N: 1039)

**7-c Decision on Simulated Tissues of 5200MHz and 5800MHz**

In the current standards (e.g., IEEE P1528, 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 5000to 5800 MHz were obtained using linear interpolation.
Therefore the dielectric parameters of 5200MHz, 5500MHz and 5800MHz were decided as following.
(5200MHz Body Tissue/ Relative Permittivity εr: **49.0**, Conductivity σ : **5.30** )
(5800MHz Body Tissue/ Relative Permittivity εr: **48.2**, Conductivity σ : **6.00**)
(The frequency for the validation)

| f (MHz) | Head Tissue | | Body Tissue | | Reference |
|---|---|---|---|---|---|
| | εr | σ [mho/m] | Er | σ [mho/m] | |
| 3000 | 38.5 | 2.40 | 52.0 | 2.73 | Standard |
| 5800 | 35.3 | 5.27 | 48.2 | 6.00 | Standard |
| 5000 | 36.2 | 4.45 | 49.3 | 5.07 | Interpolated |
| 5100 | 36.1 | 4.55 | 49.1 | 5.18 | Interpolated |
| 5200 | 36.0 | 4.66 | 49.0 | 5.30 | Interpolated |
| 5300 | 35.9 | 4.76 | 48.9 | 5.42 | Interpolated |
| 5400 | 35.8 | 4.86 | 48.7 | 5.53 | Interpolated |
| 5500 | 35.6 | 4.96 | 48.6 | 5.65 | Interpolated |
| 5600 | 35.5 | 5.07 | 48.5 | 5.77 | Interpolated |
| 5700 | 35.4 | 5.17 | 48.3 | 5.88 | Interpolated |

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

## 8. System validation data

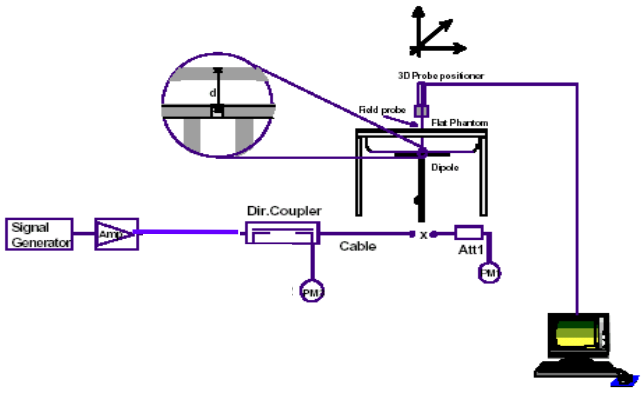
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are in the table below. Please refer to APPENDIX3.

### 8-a System validation of 5GHz

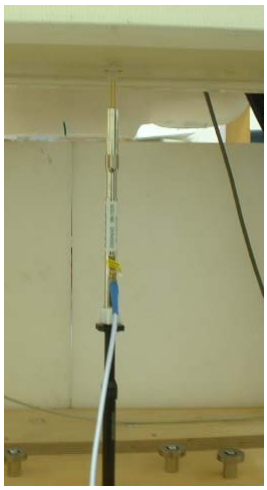
Type of liquid : **Muscle 5GHz**
Ambient temperature (deg.c.) : **24.5(8-August), 24.5(9-August),25.0 (30-August)**
Relative Humidity (%) : **60(8-August), 52(9-August),56 (30-August)**
Liquid depth (cm) : **15.0**
Dipole : **D5GHzV2; Serial: 1039**
Power : **250mW**

| SYSTEM PERFORMANCE CHECK | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Liquid ( Muscle 5GHz ) | | | | | | | | System dipole validation target & measured | | | |
| | | Liquid Temp [deg.c.] | | Relative Permittivity εr | | Conductivity σ [mho/m] | | SAR 1g [W/kg] | | Deviation [%] | Limit [%] |
| Date | Frequency | Before | After | Target | Measured | Target | Measured | Target | Measured | | |
| 8-Aug | 5200 | 24.0 | 24.0 | 49.0 | 46.7 | 5.30 | 5.46 | 18.3 | 18.3 | 0.0 | +/-10 |
| 9-Aug | 5800 | 24.0 | 24.0 | 48.2 | 46.7 | 6.00 | 6.27 | 17.7 | 18.3 | 3.4 | +/-10 |
| 30-Aug | 5200 | 24.5 | 24.5 | 49.0 | 47.1 | 5.30 | 5.09 | 18.3 | 19.8 | 8.2 | +/-10 |
| 30-Aug | 5800 | 24.4 | 24.4 | 48.2 | 48.2 | 6.00 | 6.00 | 17.7 | 19.3 | 9.0 | +/-10 |

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




**Test system for the system performance check setup diagram**



**5100-5800MHz Systemperformance check setup**

**9. Validation uncertainty**

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents[6][7] and is given in the following Table.

| Error Description | Uncertainty value ± % | Probability distribution | divisor | (ci) 1g | Standard Uncertainty (1g) | vi or veff |
|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | |
| Probe calibration | ±6.8 | Normal | 1 | 1 | ±6.8 | ∞ |
| Axial isotropy of the probe | ±4.7 | Rectangular | √3 | 1 | ±2.7 | ∞ |
| Spherical isotropy of the probe | ±9.6 | Rectangular | 0 | 0 | 0 | ∞ |
| Boundary effects | ±2.0 | Rectangular | √3 | 1 | ±1.2 | ∞ |
| Probe linearity | ±4.7 | Rectangular | √3 | 1 | ±2.7 | ∞ |
| Detection limit | ±1.0 | Rectangular | √3 | 1 | ±0.6 | ∞ |
| Readout electronics | ±0.3 | Normal | 1 | 1 | ±0.3 | ∞ |
| Response time | 0 | Rectangular | √3 | 1 | 0 | ∞ |
| Integration time | 0 | Rectangular | √3 | 1 | 0 | ∞ |
| RF ambient Noise | ±3.0 | Rectangular | √3 | 1 | ±1.7 | ∞ |
| RF ambient Reflections | ±3.0 | Rectangular | √3 | 1 | ±1.7 | ∞ |
| Probe Positioner | ±0.8 | Rectangular | √3 | 1 | ±0.5 | ∞ |
| Probe positioning | ±9.9 | Rectangular | 1 | 1 | ±5.7 | ∞ |
| Algorithms for Max.SAR Eval. | ±4.0 | Rectangular | √3 | 1 | ±2.3 | ∞ |
| **Dipole** | | | | | | |
| Dipole Axis to Liquid Distance | ±2.0 | Rectangular | √3 | 1 | ±1.2 | ∞ |
| Input power and SAR drift meas. | ±4.7 | Rectangular | √3 | 1 | ±2.7 | ∞ |
| **Phantom and Setup** | | | | | | |
| Phantom uncertainty | ±4.0 | Rectangular | √3 | 1 | ±2.3 | ∞ |
| Liquid conductivity (target) | ±5.0 | Rectangular | √3 | 0.64 | ±1.8 | ∞ |
| Liquid conductivity (meas.) | ±5.0 | Rectangular | 1 | 0.64 | ±3.2 | ∞ |
| Liquid permittivity (target) | ±5.0 | Rectangular | √3 | 0.6 | ±1.7 | ∞ |
| Liquid permittivity (meas.) | ±5.0 | Rectangular | 1 | 0.6 | ±3.0 | ∞ |
| | | | | | | |
| **Combined Standard Uncertainty** | | | | | **±12.08** | |
| **Expanded Uncertainty (k=2)** | | | | | **±24.2** | |

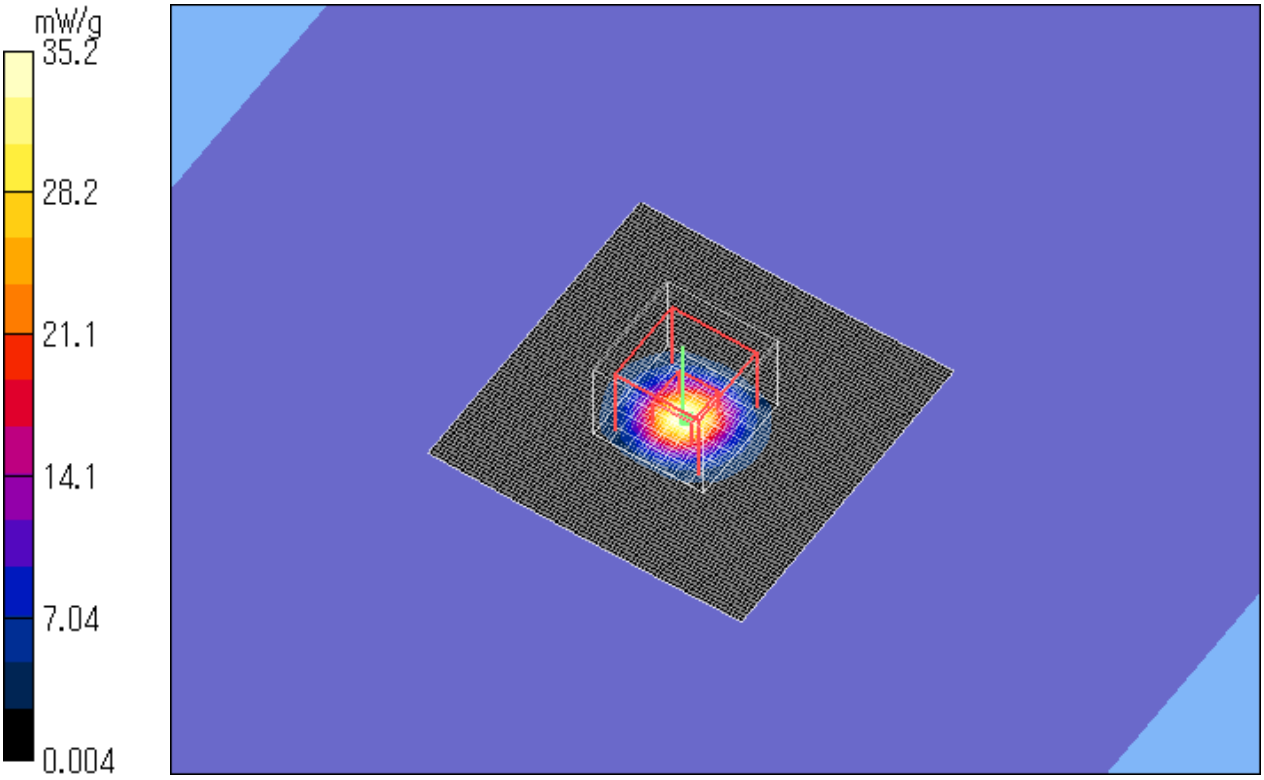
**10. Validation Measurement data**

**5200MHz System varidation /Dipole 5GHz/Forward Conducted Power :250mW**

**Dipole 5GHz; Type: D5GHzV2; Serial:1039**

Communication System: CW; Frequency: 5200 MHz;Crest factor: 1
Medium: M5200 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.46 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

**Area Scan (81x81x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 37.4 mW/g
**Zoom Scan (8x8x10)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 87.7 V/m; Power Drift = -0.015 dB
Peak SAR (extrapolated) = 74.0 W/kg
**SAR(1 g) = 18.3 mW/g; SAR(10 g) = 5.11 mW/g**
Maximum value of SAR (measured) = 35.2 mW/g
Test Date = 08/08/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C , After 24.0 degree.C

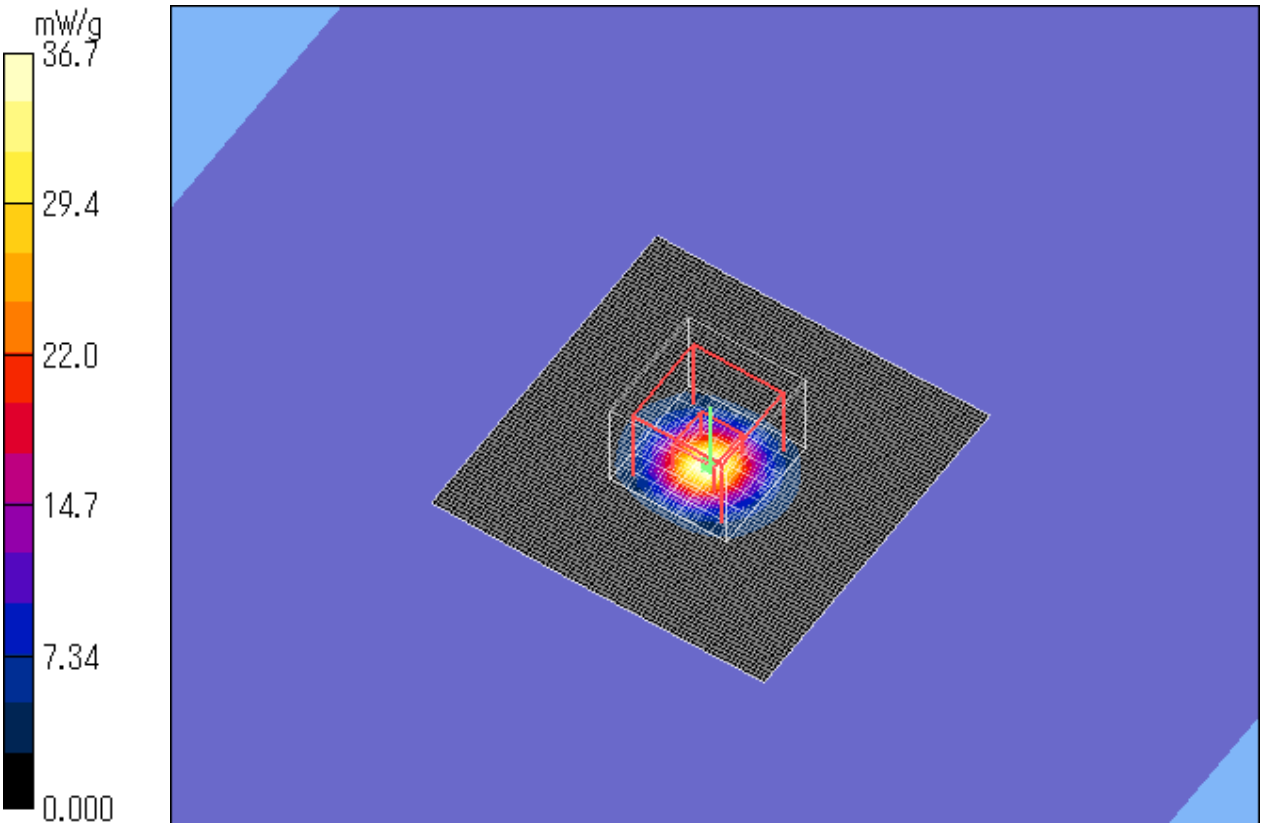


**5800MHz System varidation /Dipole 5GHz/Forward Conducted Power :250mW**

**Dipole 5GHz; Type: D5GHzV2; Serial: 1039**

Communication System: CW; Frequency: 5800 MHz;Crest factor: 1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.27 mho/m; $\varepsilon_r$ = 46.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

**Area Scan (81x81x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 40.3 mW/g
**Zoom Scan (8x8x10)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 81.6 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 85.4 W/kg
**SAR(1 g) = 18.3 mW/g; SAR(10 g) = 5.1 mW/g**
Maximum value of SAR (measured) = 36.7 mW/g
Test Date = 08/09/07
Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 24.0 degree.C , After 24.0 degree.C



**5200MHz System Validation / Dipole 5GHz / Forward Conducted Power : 250mW**

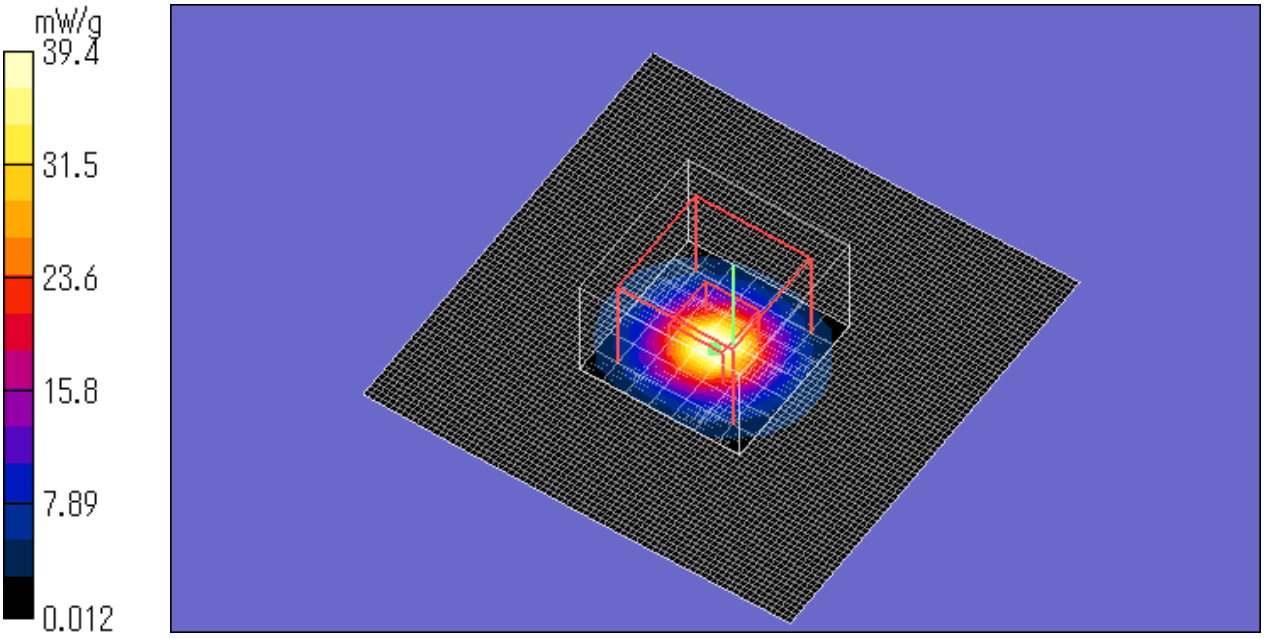
**Dipole 5GHz; Type: D5GHzV2; Serial: 1039**
Communication System: CW; Frequency: 5200 MHz;Crest factor:1
Medium: HSL5800 Medium parameters used: f = 5200 MHz; $\sigma$ = 5.09 mho/m; $\varepsilon_r$ = 47.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.68, 4.68, 4.68); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom 4.3
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

**Area Scan (81x81x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 42.7 mW/g

**Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 97.6 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 79.1 W/kg

**SAR(1 g) = 19.8 mW/g; SAR(10 g) = 5.71 mW/g**
Maximum value of SAR (measured) = 39.9 mW/g

Test Date = 08/30/07
Ambient Temperature = 25.0 degree.c
Liquid Temperature = Before 24.5 degree.C , After 24.5degree.C

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

**5800MHz System Validation / Dipole5GHz / Forward Conducted Power : 250mW**

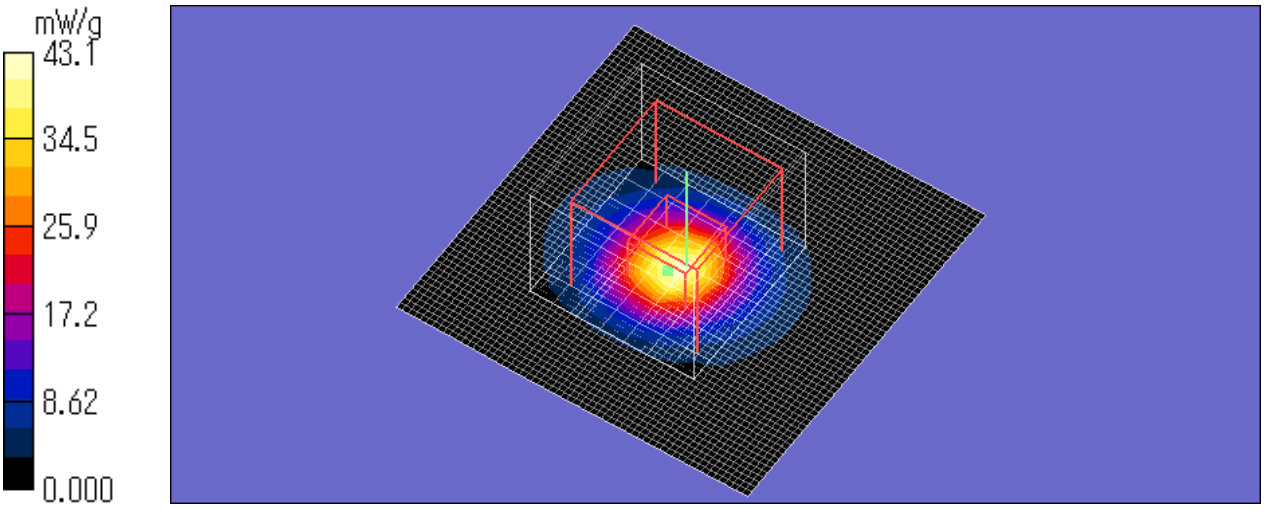
**Dipole 5GHz; Type: D5GHzV2; Serial: 1039**
Communication System: CW; Frequency: 5200 MHz;Crest factor:1
Medium: M5800 Medium parameters used: f = 5800 MHz; $\sigma$ = 6.00 mho/m; $\varepsilon_r$ = 48.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3507; ConvF(4.55, 4.55, 4.55); Calibrated: 2007/06/15
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

**Area Scan (61x61x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 40.2 mW/g

**Zoom Scan (8x8x11)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 90.2 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 90.5 W/kg

**SAR(1 g) = 19.3 mW/g; SAR(10 g) = 5.61 mW/g**
Maximum value of SAR (measured) = 45.2 mW/g

Test Date = 08/30/07
Ambient Temperature = 25.0degree.c
Liquid Temperature = Before 24.4 degree.C , After 24.4 degree.C



## 11. 5GHz System Validation Dipole (D5GHz V2, S/N: 1039)

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

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S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
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 MTT

Certificate No: D5GHzV2-1039_Feb06

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D5GHzV2 - SN: 1039 |
| Calibration procedure(s) | QA CAL-22.v1<br>Calibration procedure for dipole validation kits between 3-6 GHz |
| Calibration date: | February 10, 2006 |
| Condition of the calibrated item | In Tolerance |

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 (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 3-May-05 (METAS, No. 251-00466) | May-06 |
| Power sensor E4412A | MY41495277 | 3-May-05 (METAS, No. 251-00466) | May-06 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 3-May-05 (METAS, No. 251-00467) | May-06 |
| Reference 10 dB Attenuator | SN: 5047.2 (10r) | 11-Aug-05 (METAS, No 251-00498) | Aug-06 |
| Reference Probe EX3DV4 | SN 3503 | 19-Mar-05 (SPEAG, No. Ex3-3503_Mar05) | Mar-06 |
| DAE4 | SN 601 | 15-Dec-05 (SPEAG, No. DAE4-601_Dec05) | Dec-06 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41093315 | 10-Aug-03 (SPEAG, in house check Oct-05) | In house check: Oct-06 |
| Power meter E4419B | GB43310788 | 12-Aug-03 (SPEAG, in house check Oct-05) | In house check: Oct-06 |
| RF generator R&S SMT-06 | 100005 | 4-Aug-99 (SPEAG, in house check Nov-05) | In house check: Nov-07 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (SPEAG, in house check Nov-05) | In house check: Nov-06 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Katja Pokovic | Technical Manager | |
| Approved by: | Niels Kuster | Quality Manager | |

Issued: February 14, 2006

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

Certificate No: D5GHzV2-1039_Feb06 Page 1 of 10

**Calibration Laboratory of**
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S Schweizerischer Kalibrierdienst
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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 Std 62209 Part 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", Draft Version 0.9, December 2004
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 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.



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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY4 | V4.6 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Area Scan resolution** | dx, dy = 10 mm | |
| **Zoom Scan Resolution** | dx, dy = 4.3 mm, dz = 3 mm | |
| **Frequency** | 5200 MHz ± 1 MHz<br>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 | 35.6 ± 6 % | 4.53 mho/m ± 6 % |
| **Head TSL temperature during test** | (22.0 ± 0.2) °C | ---- | ---- |

## SAR result with Head TSL at 5200 MHz

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 20.4 mW / g |
| SAR normalized | normalized to 1W | 81.6 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **81.4 mW / g ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.75 mW / g |
| SAR normalized | normalized to 1W | 23.0 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **22.9 mW / g ± 19.5 % (k=2)** |

[1] Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"



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

### 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 | 34.6 ± 6 % | 5.09 mho/m ± 6 % |
| Head TSL temperature during test | (22.0 ± 0.2) °C | ---- | ---- |

### SAR result with Head TSL at 5800 MHz

| SAR averaged over 1 cm³ (1 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 19.9 mW / g |
| SAR normalized | normalized to 1W | 79.6 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **79.0 mW / g ± 19.9 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.59 mW / g |
| SAR normalized | normalized to 1W | 22.4 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **22.2 mW / g ± 19.5 % (k=2)** |



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

### 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 | 49.1 ± 6 % | 5.11 mho/m ± 6 % |
| **Body TSL temperature during test** | (22.0 ± 0.2) °C | ---- | ---- |

### SAR result with Body TSL at 5200 MHz

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 18.3 mW / g |
| SAR normalized | normalized to 1W | 73.2 mW / g |
| SAR for nominal Body TSL parameters [1] | normalized to 1W | **73.3 mW / g ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.17 mW / g |
| SAR normalized | normalized to 1W | 20.7 mW / g |
| SAR for nominal Body TSL parameters [1] | normalized to 1W | **20.6 mW / g ± 19.5 % (k=2)** |

### 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 | 47.8± 6 % | 5.88 mho/m ± 6 % |
| **Body TSL temperature during test** | (22.0 ± 0.2) °C | ---- | ---- |

### SAR result with Body TSL at 5800 MHz

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 17.7 mW / g |
| SAR normalized | normalized to 1W | 70.8 mW / g |
| SAR for nominal Body TSL parameters [1] | normalized to 1W | **70.6 mW / g ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.96 mW / g |
| SAR normalized | normalized to 1W | 19.8 mW / g |
| SAR for nominal Body TSL parameters [1] | normalized to 1W | **19.8 mW / g ± 19.5 % (k=2)** |



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

### Antenna Parameters with Head TSL at 5200 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 51.5 Ω - 8.2 jΩ |
| Return Loss | -21.7 dB |

### Antenna Parameters with Head TSL at 5800 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 55.0 Ω + 0.1 jΩ |
| Return Loss | -26.3 dB |

### Antenna Parameters with Body TSL at 5200 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 49.0 Ω - 2.3 jΩ |
| Return Loss | -31.8 dB |

### Antenna Parameters with Body TSL at 5800 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 58.4 Ω + 2.2 jΩ |
| Return Loss | -21.8 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.199 ns |

After long term use with 40 W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | December 30, 2005 |



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

**DASY4 Validation Report for Head TSL**

Date/Time: 10.02.2006 16:41:16

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1039**

Communication System: CW-5GHz; Frequency: 5200 MHz Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: HSL 5800 MHz;
Medium parameters used: f = 5200 MHz; $\sigma$ = 4.53 mho/m; $\varepsilon_r$ = 35.6; $\rho$ = 1000 kg/m$^3$ Medium parameters used: f = 5800 MHz; $\sigma$ = 5.09 mho/m; $\varepsilon_r$ = 34.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.56, 5.56, 5.56) ConvF(4.95, 4.95, 4.95); Calibrated: 19.03.2005
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 47; Postprocessing SW: SEMCAD, V1.8 Build 160

**d=10mm, Pin=250mW, f=5200 MHz/Area Scan (91x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 44.2 mW/g

**d=10mm, Pin=250mW, f=5200 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:**
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 84.2 V/m; Power Drift = 0.132 dB
Peak SAR (extrapolated) = 76.7 W/kg
**SAR(1 g) = 20.4 mW/g; SAR(10 g) = 5.75 mW/g**
Maximum value of SAR (measured) = 38.5 mW/g

**d=10mm, Pin=250mW, f=5800 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:**
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 77.5 V/m; Power Drift = 0.043 dB
Peak SAR (extrapolated) = 84.2 W/kg
**SAR(1 g) = 19.9 mW/g; SAR(10 g) = 5.59 mW/g**
Maximum value of SAR (measured) = 41.5 mW/g



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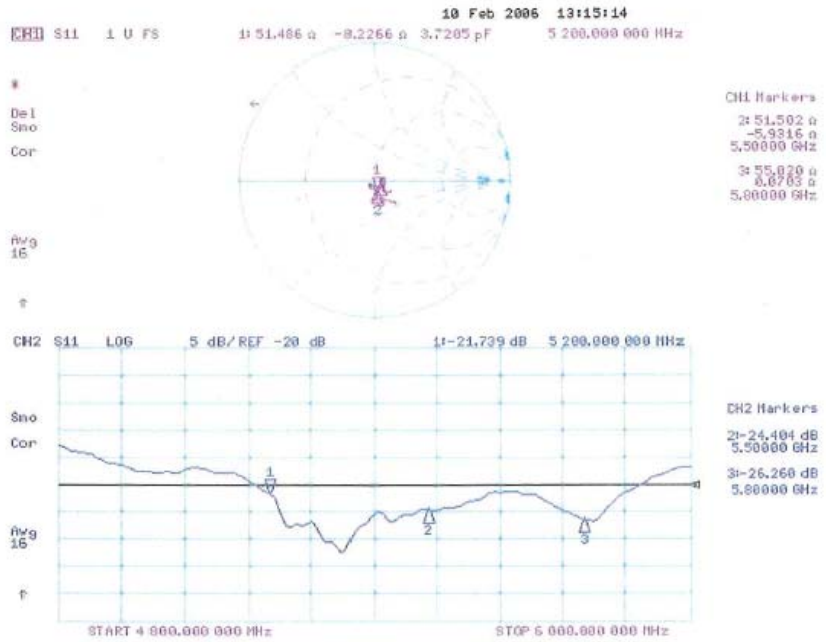
**4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN**
**Telephone : +81 596 24 8116**
**Facsimile : +81 596 24 8124**

**Impedance Measurement Plot for Head TSL**



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**4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN**
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**DASY4 Validation Report for Body TSL**

Date/Time: 10.02.2006 19:25:25

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1039**

Communication System: CW-5GHz; Frequency: 5800 MHz Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: MSL 5800 MHz;
Medium parameters used: f = 5800 MHz; $\sigma$ = 5.88 mho/m; $\varepsilon_r$ = 47.8; $\rho$ = 1000 kg/m$^3$ Medium parameters used: f = 5200 MHz; $\sigma$ = 5.11 mho/m; $\varepsilon_r$ = 49.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.69, 4.69, 4.69) ConvF(5.18, 5.18, 5.18); Calibrated: 19.03.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 47; Postprocessing SW: SEMCAD, V1.8 Build 160

**d=10mm, Pin=250mW, f=5800 MHz/Area Scan (101x101x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 20.3 mW/g

**d=10mm, Pin=250mW, f=5200 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:**
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 77.8 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 64.3 W/kg
**SAR(1 g) = 18.3 mW/g; SAR(10 g) = 5.17 mW/g**
Maximum value of SAR (measured) = 34.4 mW/g

**d=10mm, Pin=250mW, f=5800 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0:**
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 70.9 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 70.7 W/kg
**SAR(1 g) = 17.7 mW/g; SAR(10 g) = 4.96 mW/g**



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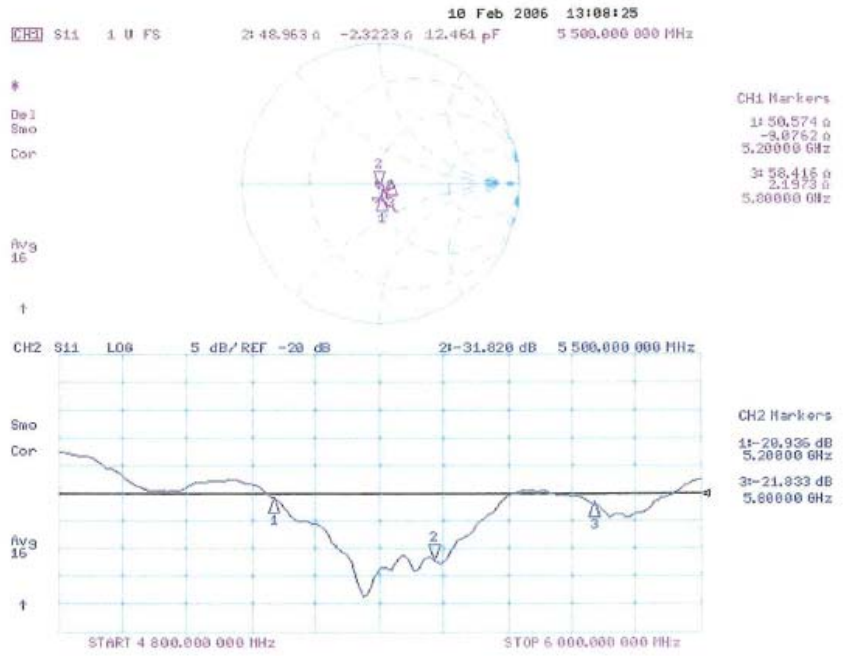
**4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN**
**Telephone : +81 596 24 8116**
**Facsimile : +81 596 24 8124**

**Impedance Measurement Plot for 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 8116**
**Facsimile : +81 596 24 8124**

## 12. Dosimetric E-Field Probe Calibration (EX3DV3,S/N: 3507)

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

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Accreditation No.: **SCS 108**

Client **UL Japan (MTT)**

Certificate No: **EX3-3507_Jun07**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV3 - SN:3507 |
| Calibration procedure(s) | QA CAL-01.v6 and QA CAL-14.v3<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | June 15, 2007 |
| Condition of the calibrated item | In Tolerance |

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 (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 29-Mar-07 (METAS, No. 217-00670) | Mar-08 |
| Power sensor E4412A | MY41495277 | 29-Mar-07 (METAS, No. 217-00670) | Mar-08 |
| Power sensor E4412A | MY41498087 | 29-Mar-07 (METAS, No. 217-00670) | Mar-08 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 10-Aug-06 (METAS, No. 217-00592) | Aug-07 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-07 (METAS, No. 217-00671) | Mar-08 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 10-Aug-06 (METAS, No. 217-00593) | Aug-07 |
| Reference Probe ES3DV2 | SN: 3013 | 4-Jan-07 (SPEAG, No. ES3-3013_Jan07) | Jan-08 |
| DAE4 | SN: 654 | 20-Apr-07 (SPEAG, No. DAE4-654_Apr07) | Apr-08 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Nov-05) | In house check: Nov-07 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Oct-06) | In house check: Oct-07 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Katja Pokovic | Technical Manager | |
| Approved by: | Fin Bomholt | R&D Director | |

Issued: June 15, 2007

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

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Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| Polarization φ | φ rotation around probe axis |
| Polarization ϑ | ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis |

**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

**Methods Applied and Interpretation of Parameters:**

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the $E^2$-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.



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

# Probe EX3DV3

# SN:3507

| | |
|---|---|
| Manufactured: | December 15, 2003 |
| Last calibrated: | May 26, 2006 |
| Repaired: | June 1, 2007 |
| Recalibrated: | June 15, 2007 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



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# DASY - Parameters of Probe: EX3DV3 SN:3507

## Sensitivity in Free Space[A] Diode Compression[B]

| | | | | |
|---|---|---|---|---|
| NormX | **0.750** ± 10.1% | $\mu V/(V/m)^2$ | DCP X | **97** mV |
| NormY | **0.710** ± 10.1% | $\mu V/(V/m)^2$ | DCP Y | **94** mV |
| NormZ | **0.700** ± 10.1% | $\mu V/(V/m)^2$ | DCP Z | **92** mV |

## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

**Please see Page 8.**

## Boundary Effect

**TSL** **900 MHz** **Typical SAR gradient: 5 % per mm**

| Sensor Center to Phantom Surface Distance | | **2.0 mm** | **3.0 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 3.8 | 1.6 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.0 | 0.0 |

**TSL** **1810 MHz** **Typical SAR gradient: 10 % per mm**

| Sensor Center to Phantom Surface Distance | | **2.0 mm** | **3.0 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 4.5 | 3.5 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.2 | 0.4 |

## Sensor Offset

| | |
|---|---|
| Probe Tip to Sensor Center | **1.0** mm |

**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%.**

[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.



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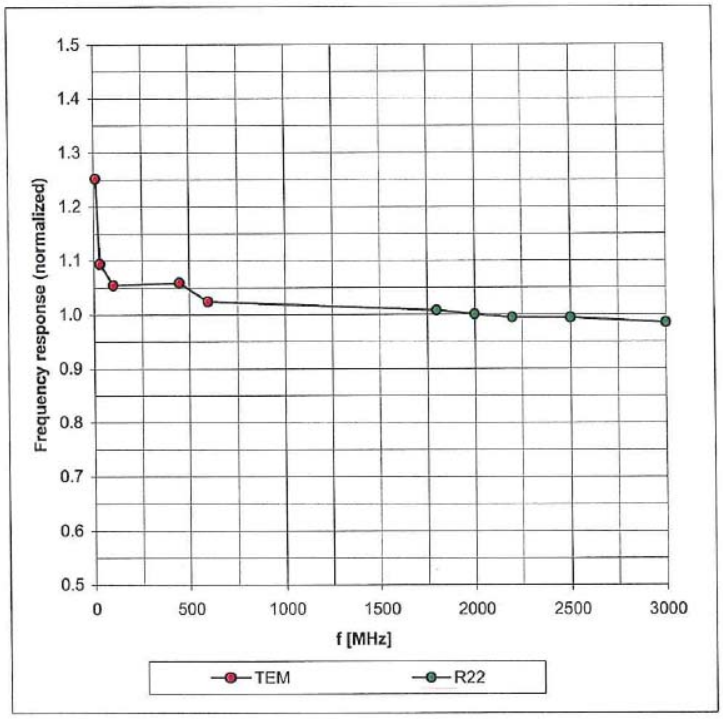
## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)




Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)



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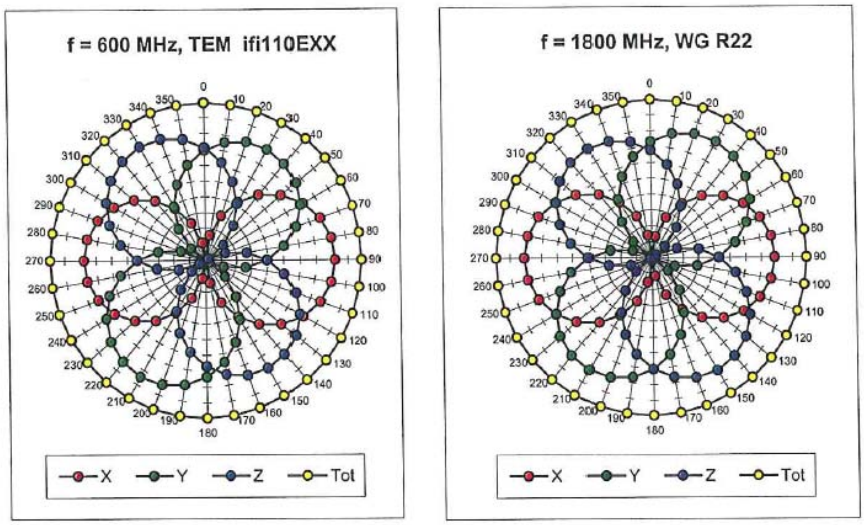
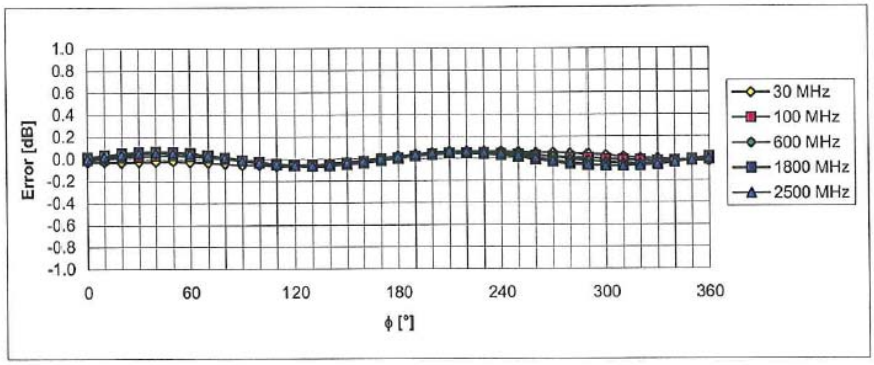
## Receiving Pattern ($\phi$), $\vartheta$ = 0°




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)



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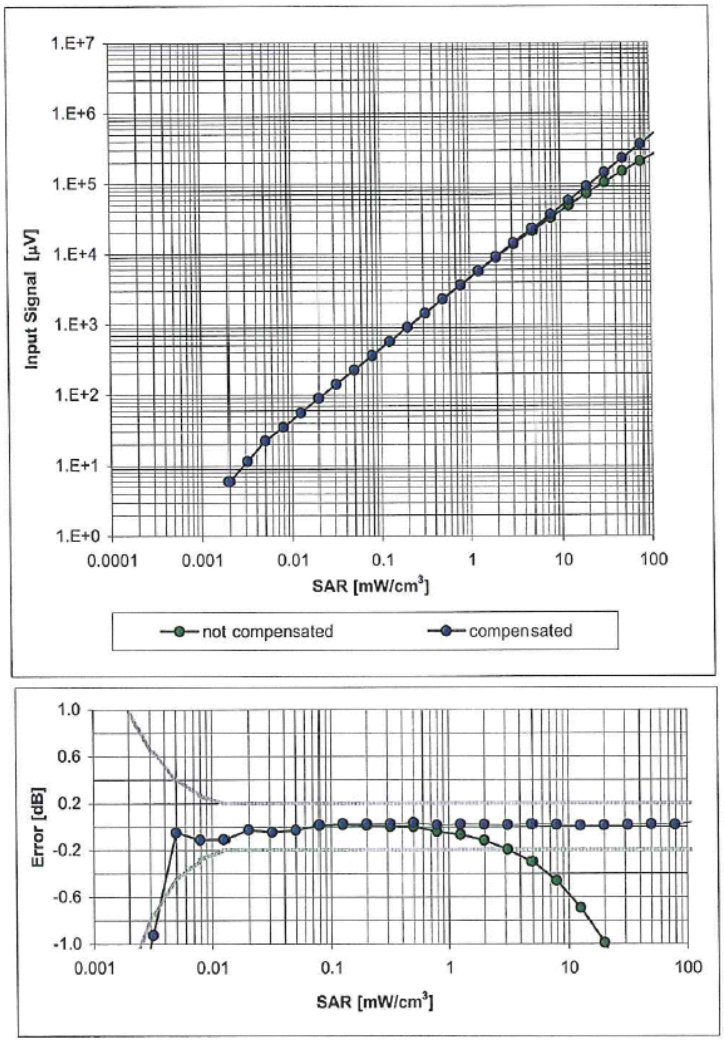
## Dynamic Range f($SAR_{head}$)

(Waveguide R22, f = 1800 MHz)







Uncertainty of Linearity Assessment: ± 0.6% (k=2)



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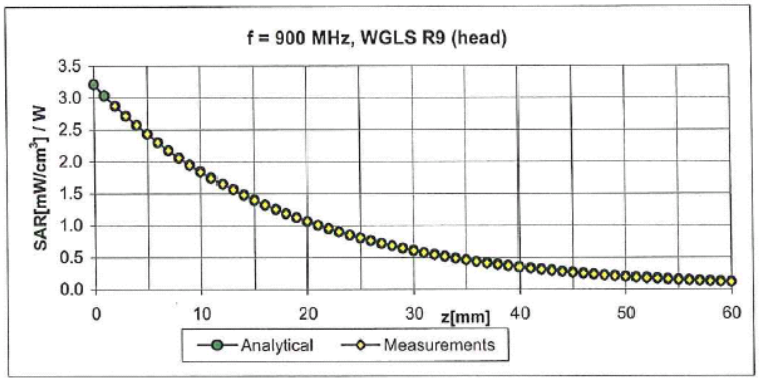
# Conversion Factor Assessment




| f [MHz] | Validity [MHz][C] | TSL | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty |
|---|---|---|---|---|---|---|---|
| 900 | ± 50 / ± 100 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.55 | 0.80 | 10.05 ± 11.0% (k=2) |
| 1640 | ± 50 / ± 100 | Head | 40.3 ± 5% | 1.29 ± 5% | 0.22 | 1.00 | 9.61 ± 11.0% (k=2) |
| 1810 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.17 | 1.00 | 8.82 ± 11.0% (k=2) |
| 2000 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.34 | 1.00 | 8.28 ± 11.0% (k=2) |
| 2450 | ± 50 / ± 100 | Head | 39.2 ± 5% | 1.80 ± 5% | 0.29 | 1.00 | 8.05 ± 11.8% (k=2) |
| 5200 | ± 50 / ± 100 | Head | 36.0 ± 5% | 4.66 ± 5% | 0.32 | 1.75 | 5.46 ± 13.1% (k=2) |
| 5500 | ± 50 / ± 100 | Head | 35.6 ± 5% | 4.96 ± 5% | 0.30 | 1.75 | 5.05 ± 13.1% (k=2) |
| 5800 | ± 50 / ± 100 | Head | 35.3 ± 5% | 5.27 ± 5% | 0.32 | 1.75 | 4.80 ± 13.1% (k=2) |
| 900 | ± 50 / ± 100 | Body | 55.0 ± 5% | 1.05 ± 5% | 0.55 | 0.80 | 9.69 ± 11.0% (k=2) |
| 1640 | ± 50 / ± 100 | Body | 53.8 ± 5% | 1.40 ± 5% | 0.10 | 1.18 | 9.66 ± 11.0% (k=2) |
| 1810 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.12 | 1.34 | 8.93 ± 11.0% (k=2) |
| 2000 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.37 | 1.00 | 8.33 ± 11.0% (k=2) |
| 2450 | ± 50 / ± 100 | Body | 52.7 ± 5% | 1.95 ± 5% | 0.40 | 1.00 | 8.00 ± 11.8% (k=2) |
| 5200 | ± 50 / ± 100 | Body | 49.0 ± 5% | 5.30 ± 5% | 0.35 | 1.80 | 4.68 ± 13.1% (k=2) |
| 5500 | ± 50 / ± 100 | Body | 48.6 ± 5% | 5.65 ± 5% | 0.32 | 1.80 | 4.33 ± 13.1% (k=2) |
| 5800 | ± 50 / ± 100 | Body | 48.2 ± 5% | 6.00 ± 5% | 0.30 | 1.80 | 4.55 ± 13.1% (k=2) |

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.



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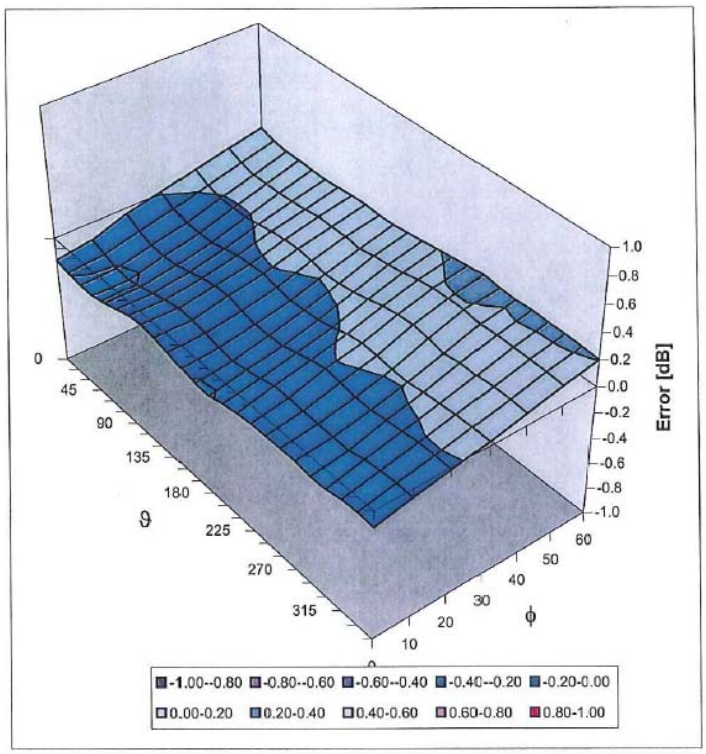
## Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz




Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)



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**13. References**

[1]ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
[2] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15-17, 1997, pp. 120-124.
[3] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-_field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
[4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
[5] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.
[6]SPEAG uncertainty document for DASY 4 System from SPEAG (Shimid & Partner Engineering AG).
[7]SPEAG uncertainty document for "the 5-6GHz Extension" from SPEAG (Shimid & Partner Engineering AG).

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