



Attachment 1 – System Validation Plots

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

System Validation**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: 2d038**

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

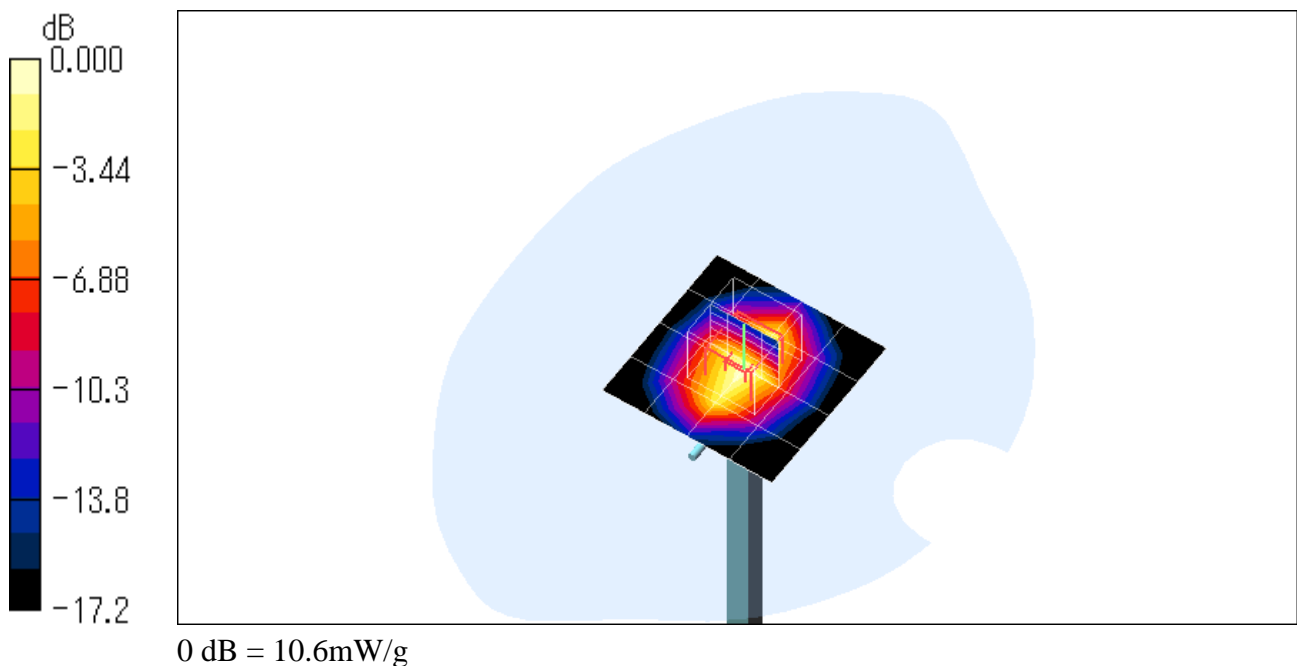
Medium: HSL1800 Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.37 \text{ mho/m}$; $\epsilon_r = 38.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Antenna Input Power 250 mW/Area Scan (5x5x1): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$ Maximum value of SAR (measured) = 10.8 mW/g **Antenna Input Power 250 mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 92.9 V/m ; Power Drift = -0.075 dB Peak SAR (extrapolated) = 16.8 W/kg **SAR(1 g) = 9.49 mW/g ; SAR(10 g) = 5.03 mW/g** Maximum value of SAR (measured) = 10.6 mW/g 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

System Validation**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: 2d038**

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

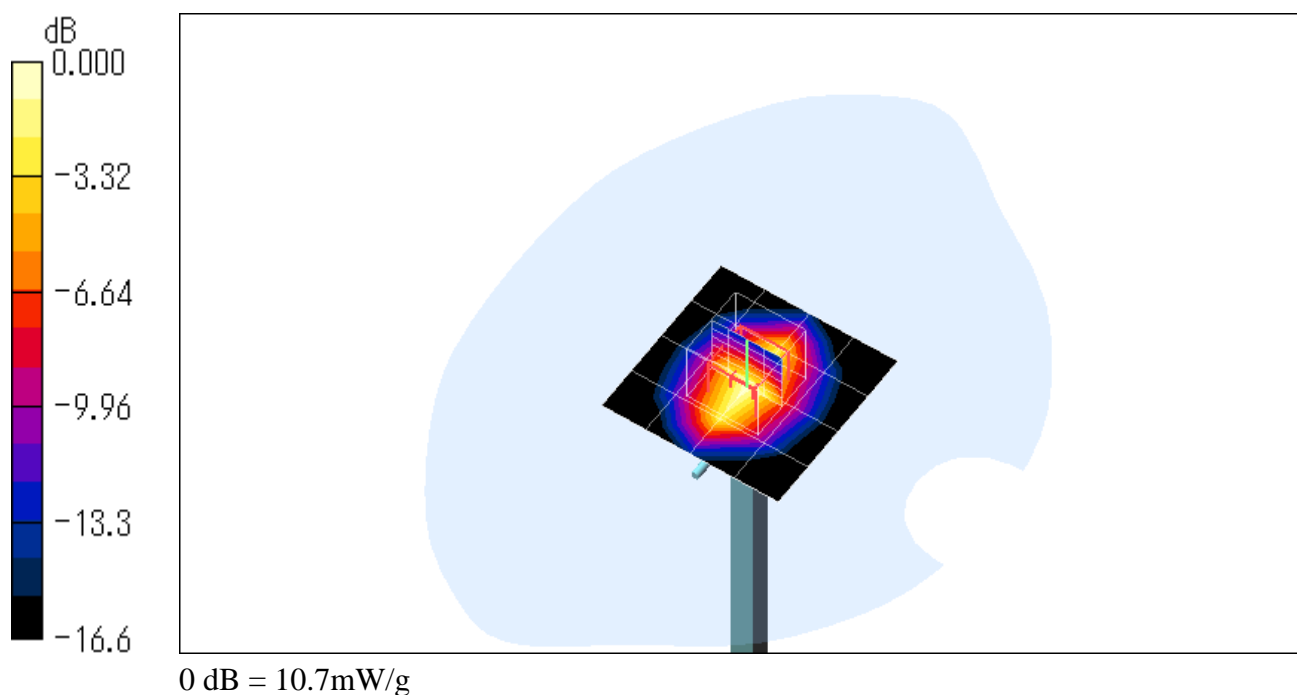
Medium: M1800 Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.47 \text{ mho/m}$; $\epsilon_r = 51.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(4.8, 4.8, 4.8); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1194; Type: QD 000 P40 CA; Serial: 1194
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Antenna Input Power 250 mW/Area Scan (5x5x1): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$ Maximum value of SAR (measured) = 10.7 mW/g **Antenna Input Power 250 mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 91.2 V/m ; Power Drift = 0.005 dB Peak SAR (extrapolated) = 15.5 W/kg **SAR(1 g) = 9.43 mW/g ; SAR(10 g) = 5.1 mW/g** 



Attachment 2 – SAR Test Plots

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 512ch (1850.20MHz)**DUT: Cellular Phone; Type: F884i; Serial: 355279010006576**

Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8

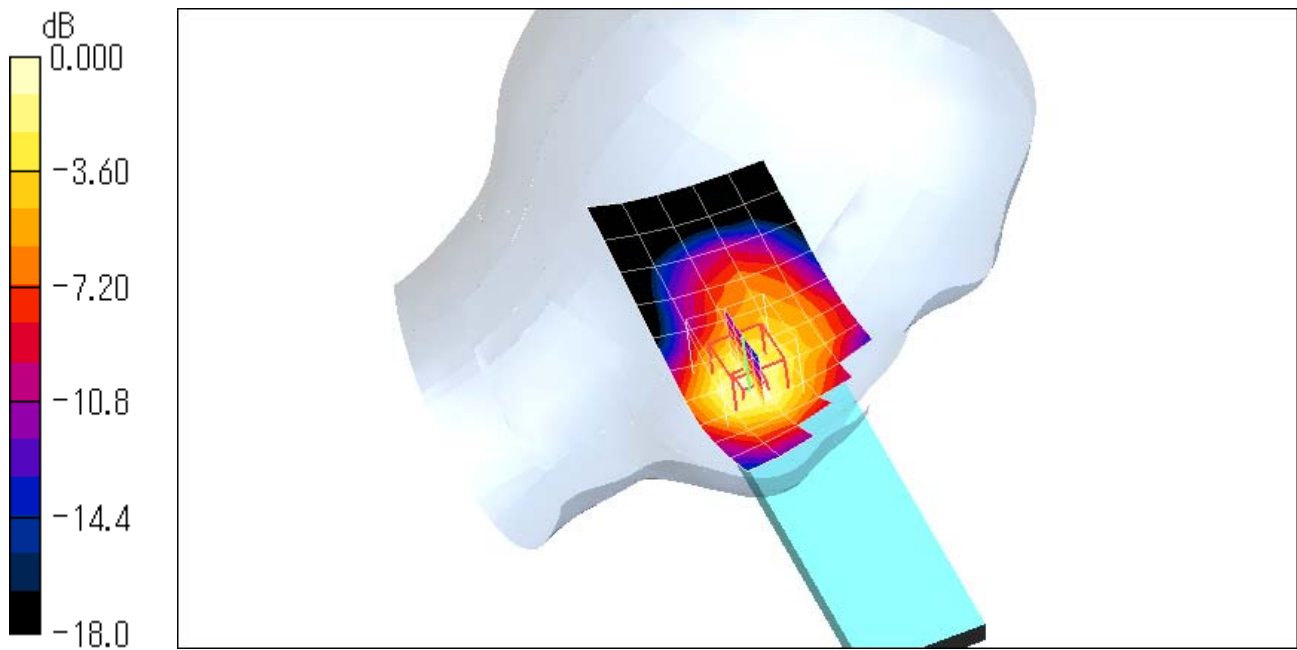
Medium: HSL1900 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek/Touch Position/Area Scan (11x6x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$ Maximum value of SAR (measured) = 0.231 mW/g **Cheek/Touch Position/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 10.8 V/m ; Power Drift = 0.011 dB Peak SAR (extrapolated) = 0.337 W/kg **SAR(1 g) = 0.228 mW/g ; SAR(10 g) = 0.137 mW/g** Maximum value of SAR (measured) = 0.250 mW/g 0 dB = 0.250mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 512ch (1850.20MHz)

DUT: Cellular Phone; Type: F884i; Serial: 355279010006576

Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8

Medium: HSL1900 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

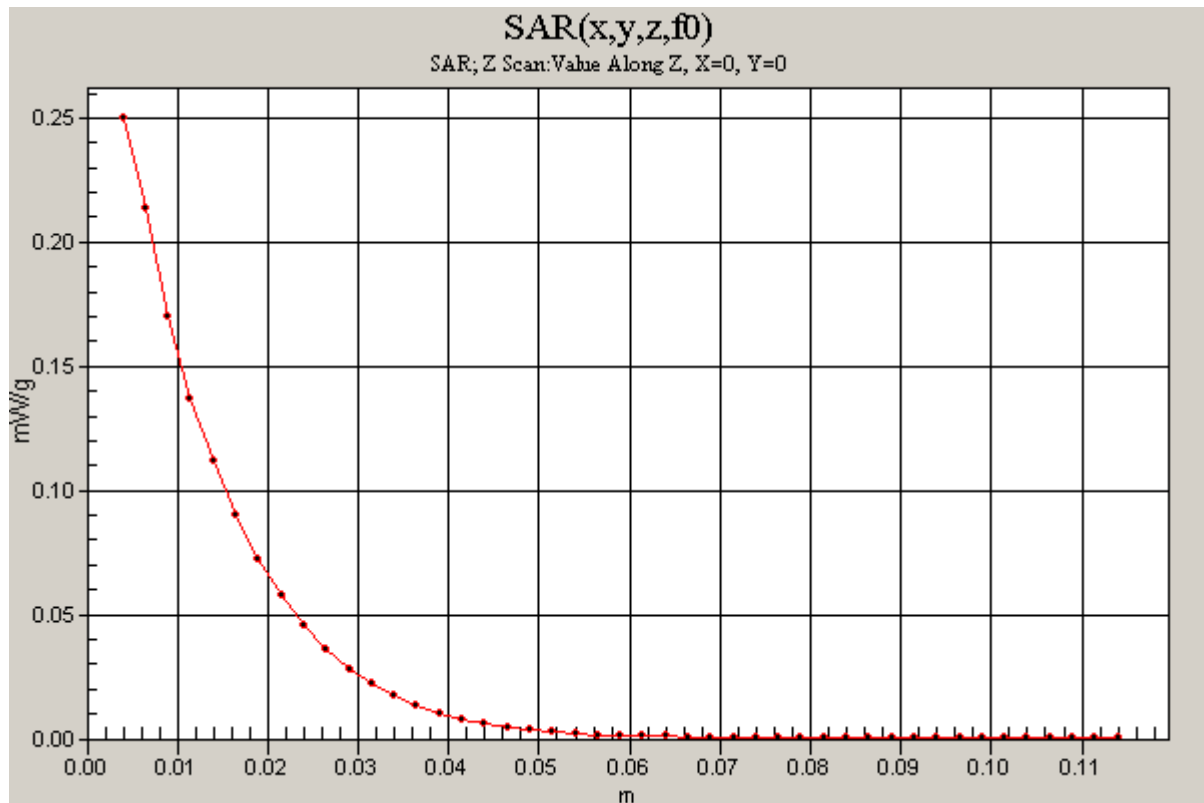
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek/Touch Position/Z Scan (1x1x45): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$, $dz=2.5\text{mm}$

Maximum value of SAR (measured) = 0.250 mW/g



Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 661ch (1880.00MHz)

DUT: Cellular Phone; Type: F884i; Serial: 355279010006576

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8

Medium: HSL1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 38.4$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek/Touch Position/Area Scan (11x6x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.215 mW/g

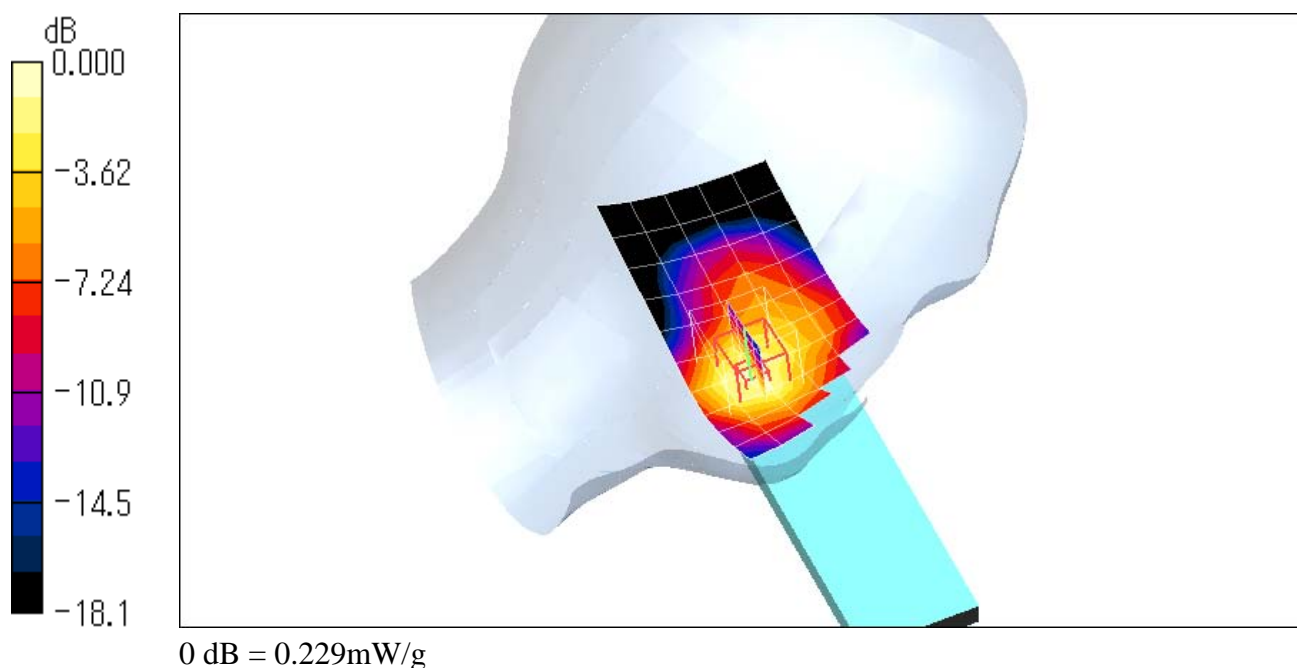
Cheek/Touch Position/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.3 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 0.309 W/kg

SAR(1 g) = 0.209 mW/g; SAR(10 g) = 0.125 mW/g

Maximum value of SAR (measured) = 0.229 mW/g



Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 810ch (1909.80MHz)

DUT: Cellular Phone; Type: F884i; Serial: 355279010006576

Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8

Medium: HSL1900 Medium parameters used: $f = 1909.8 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek/Touch Position/Area Scan (11x6x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

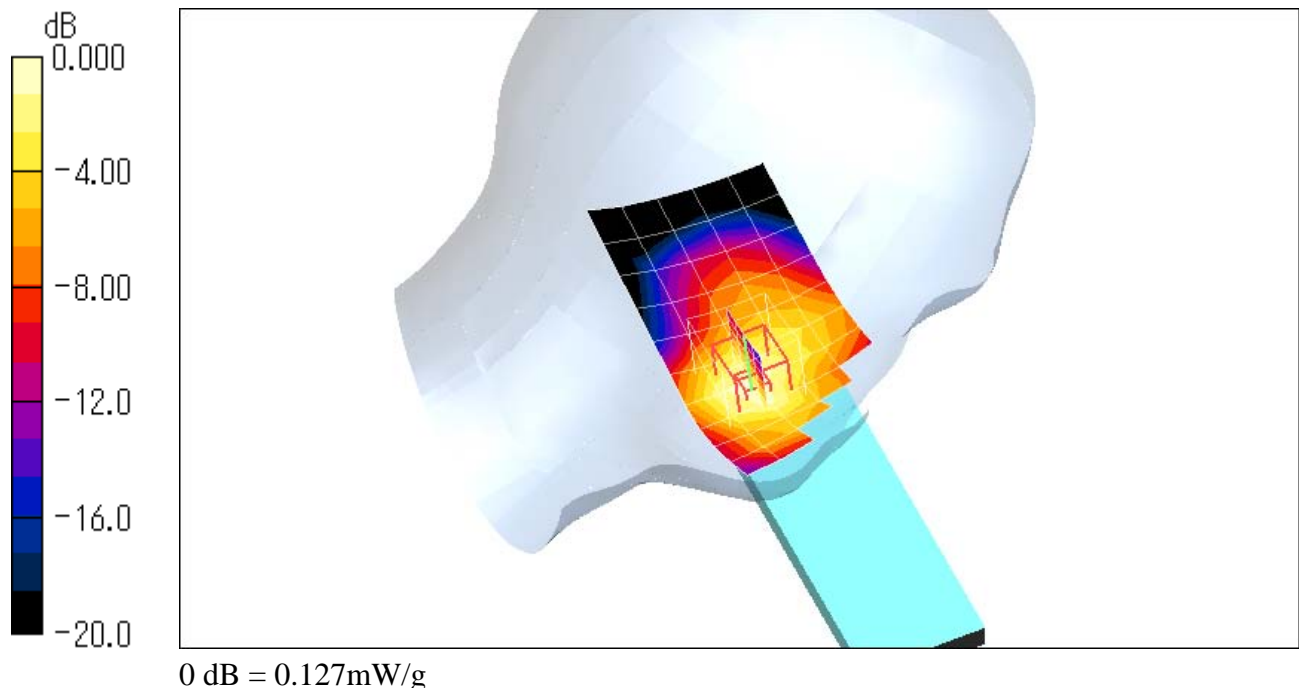
Maximum value of SAR (measured) = 0.127 mW/g

Cheek/Touch Position/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 8.12 V/m ; Power Drift = -0.071 dB

Peak SAR (extrapolated) = 0.170 W/kg

SAR(1 g) = 0.117 mW/g ; SAR(10 g) = 0.071 mW/g



Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Ear/Tilt 661ch (1880.00MHz)**DUT: Cellular Phone; Type: F884i; Serial: 355279010006576**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8

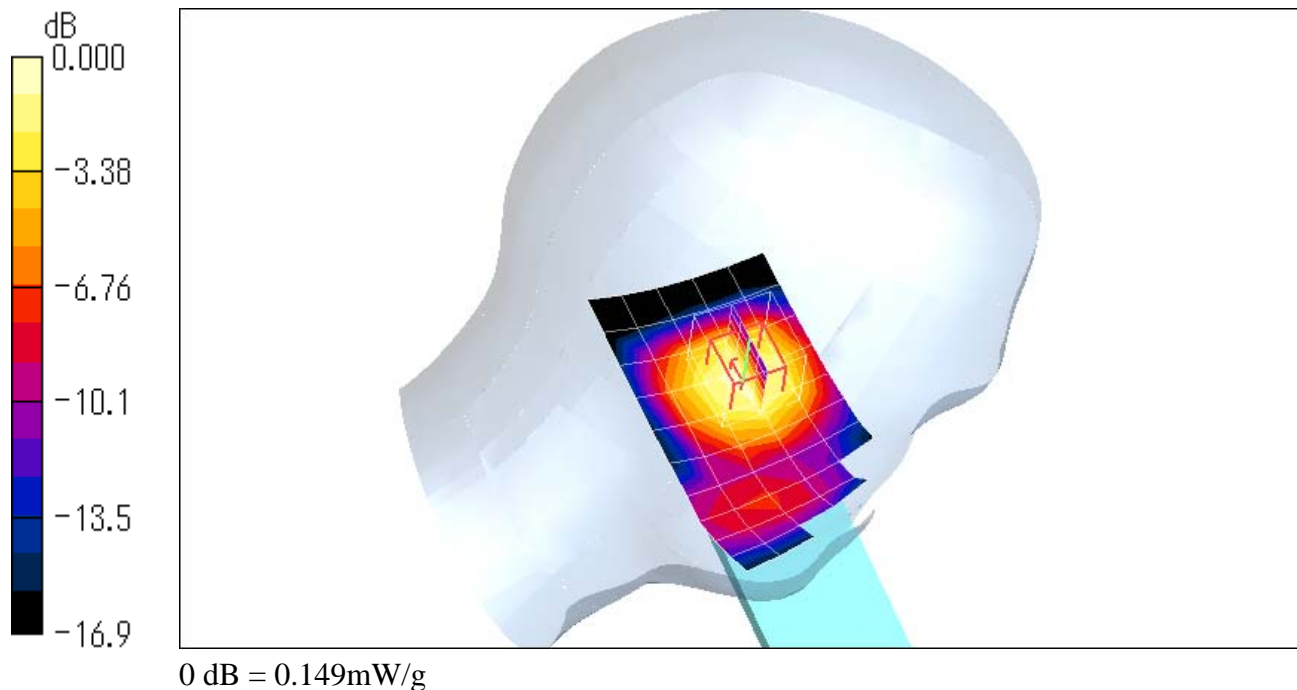
Medium: HSL1900 Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DAS4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Ear/Tilt Position/Area Scan (11x6x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$ Maximum value of SAR (measured) = 0.149 mW/g **Ear/Tilt Position/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 7.52 V/m ; Power Drift = -0.031 dB Peak SAR (extrapolated) = 0.214 W/kg **SAR(1 g) = 0.141 mW/g ; SAR(10 g) = 0.086 mW/g** 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Right Head, Cheek/Touch 661ch (1880.00MHz)**DUT: Cellular Phone; Type: F884i; Serial: 355279010006576**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8

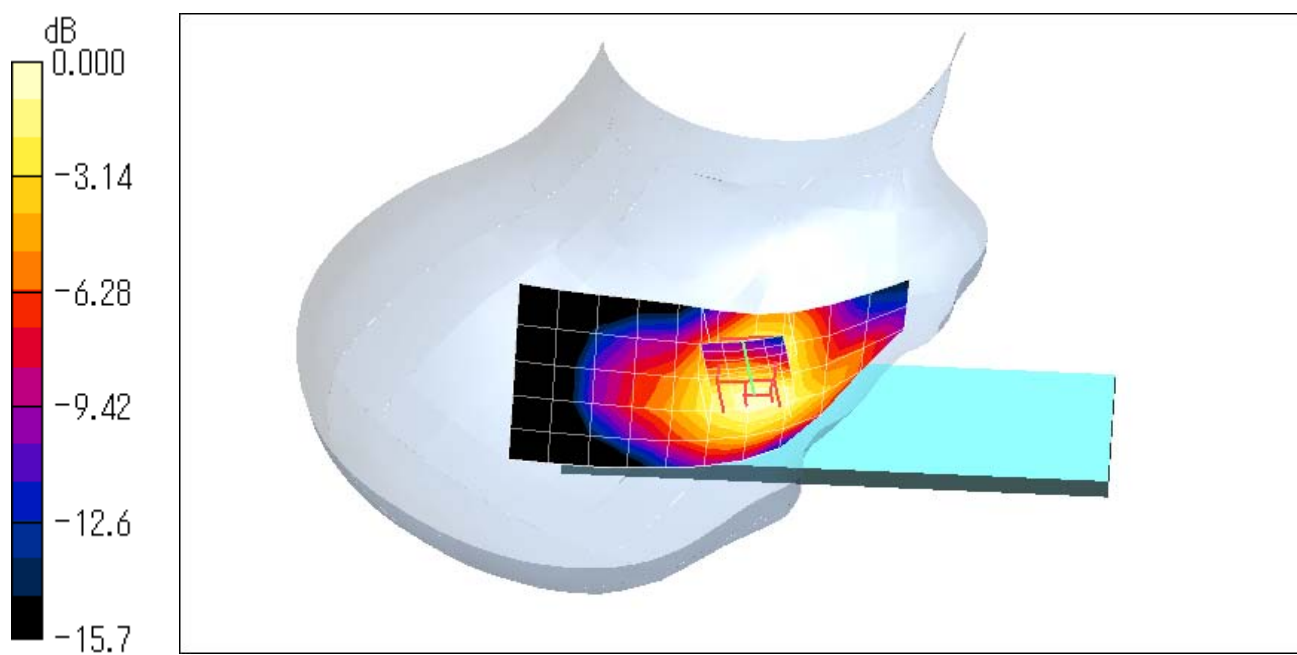
Medium: HSL1900 Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek/Touch Position/Area Scan (11x6x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$ Maximum value of SAR (measured) = 0.197 mW/g **Cheek/Touch Position/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 10.9 V/m ; Power Drift = -0.016 dB Peak SAR (extrapolated) = 0.271 W/kg **SAR(1 g) = 0.192 mW/g ; SAR(10 g) = 0.123 mW/g** Maximum value of SAR (measured) = 0.208 mW/g 0 dB = 0.208mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Right Head, Ear/Tilt 661ch (1880.00MHz)**DUT: Cellular Phone; Type: F884i; Serial: 355279010006576**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8

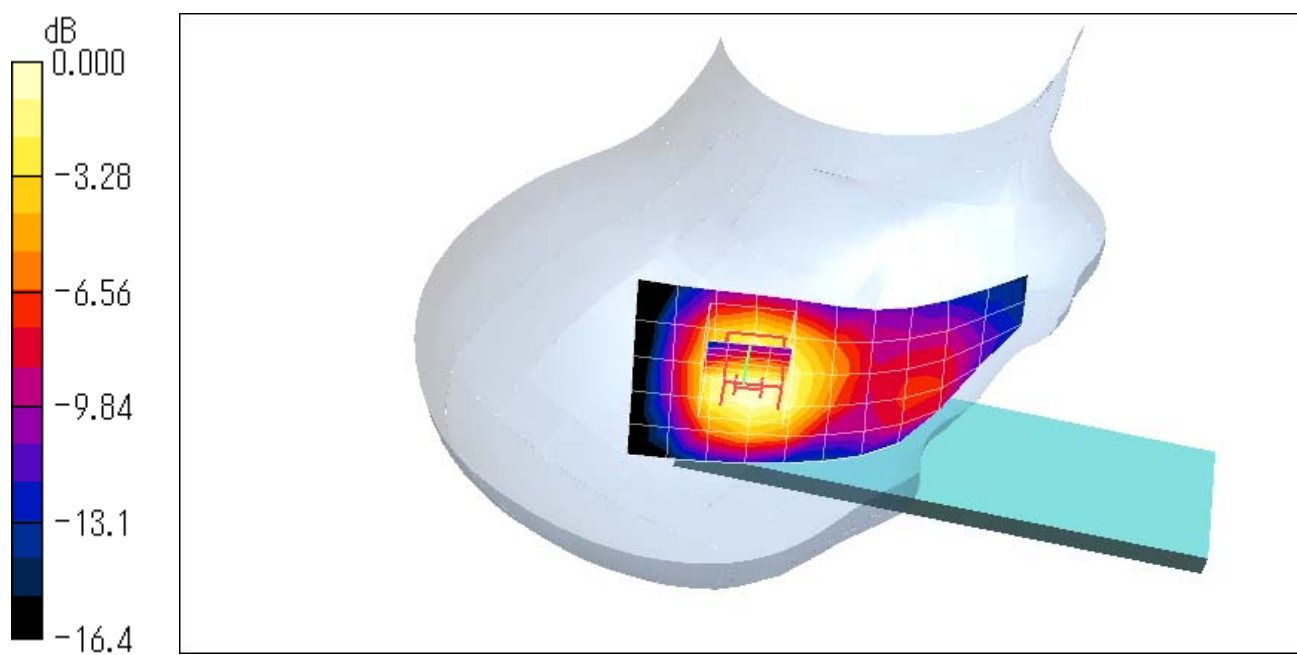
Medium: HSL1900 Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(5.36, 5.36, 5.36); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1200; Type: QD 000 P40 CA; Serial: 1200
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Ear/Tilt Position/Area Scan (11x6x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$ Maximum value of SAR (measured) = 0.131 mW/g **Ear/Tilt Position/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 7.24 V/m ; Power Drift = 0.029 dB Peak SAR (extrapolated) = 0.182 W/kg **SAR(1 g) = 0.126 mW/g ; SAR(10 g) = 0.080 mW/g** Maximum value of SAR (measured) = 0.135 mW/g 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 512ch (1850.20MHz)**DUT: Cellular Phone; Type: F884i; Serial: 355279010006576**

Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8

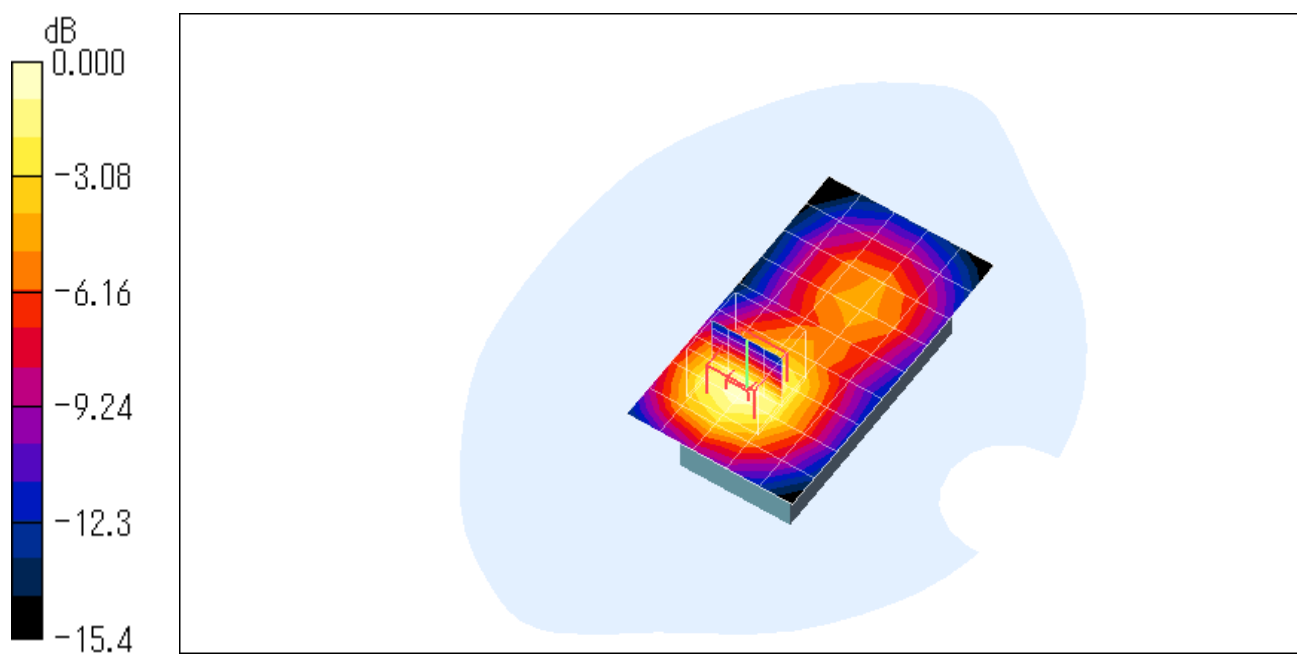
Medium: M1900 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.57 \text{ mho/m}$; $\epsilon_r = 51.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(4.8, 4.8, 4.8); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1194; Type: QD 000 P40 CA; Serial: 1194
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn/Area Scan (6x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$ Maximum value of SAR (measured) = 0.112 mW/g **Body-worn/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 7.38 V/m ; Power Drift = -0.053 dB Peak SAR (extrapolated) = 0.176 W/kg **SAR(1 g) = 0.110 mW/g ; SAR(10 g) = 0.065 mW/g** Maximum value of SAR (measured) = 0.120 mW/g 0 dB = 0.120mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 661ch (1880.00MHz)

DUT: Cellular Phone; Type: F884i; Serial: 355279010006576

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8

Medium: M1900 Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.57 \text{ mho/m}$; $\epsilon_r = 51.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(4.8, 4.8, 4.8); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1194; Type: QD 000 P40 CA; Serial: 1194
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn/Area Scan (6x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.118 mW/g

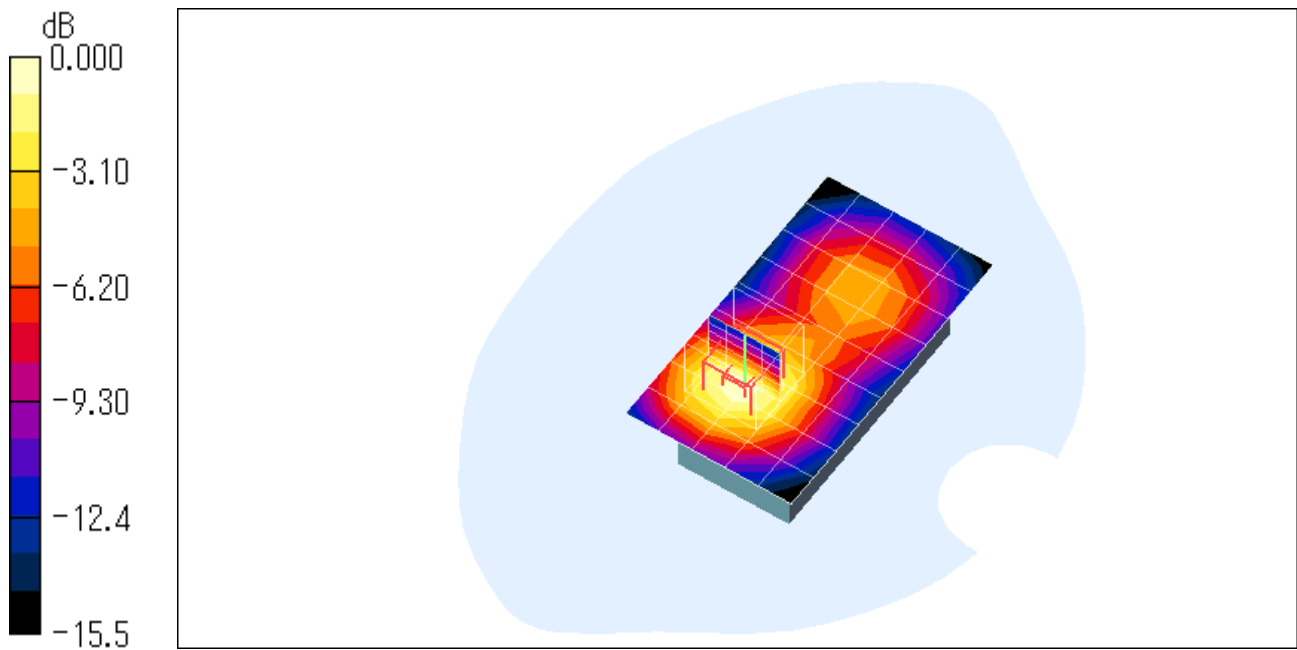
Body-worn/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 7.75 V/m ; Power Drift = 0.000 dB

Peak SAR (extrapolated) = 0.193 W/kg

SAR(1 g) = 0.118 mW/g ; SAR(10 g) = 0.070 mW/g

Maximum value of SAR (measured) = 0.129 mW/g



0 dB = 0.129 mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 661ch (1880.00MHz)**DUT: Cellular Phone; Type: F884i; Serial: 355279010006576**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8

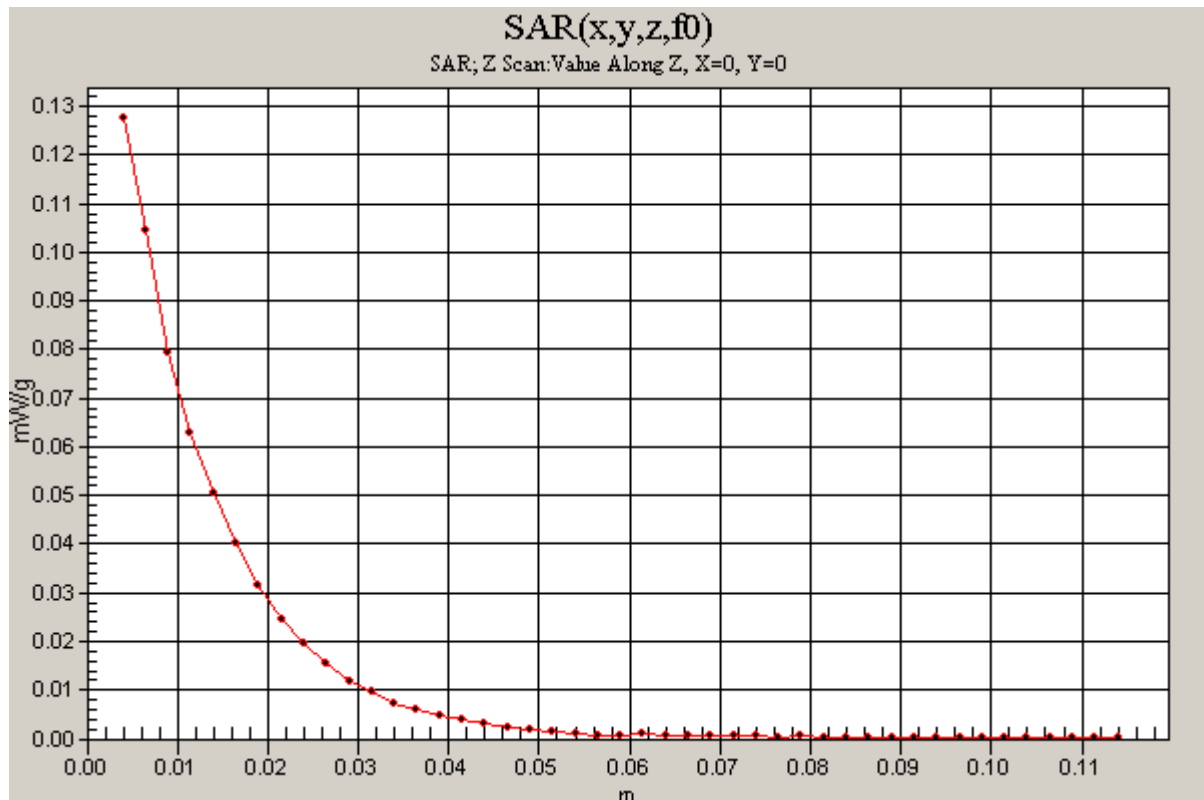
Medium: M1900 Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.57 \text{ mho/m}$; $\epsilon_r = 51.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(4.8, 4.8, 4.8); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1194; Type: QD 000 P40 CA; Serial: 1194
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn/Z Scan (1x1x45): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$, $dz=2.5\text{mm}$ Maximum value of SAR (measured) = 0.128 mW/g 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 810ch (1909.80MHz)**DUT: Cellular Phone; Type: F884i; Serial: 355279010006576**

Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8

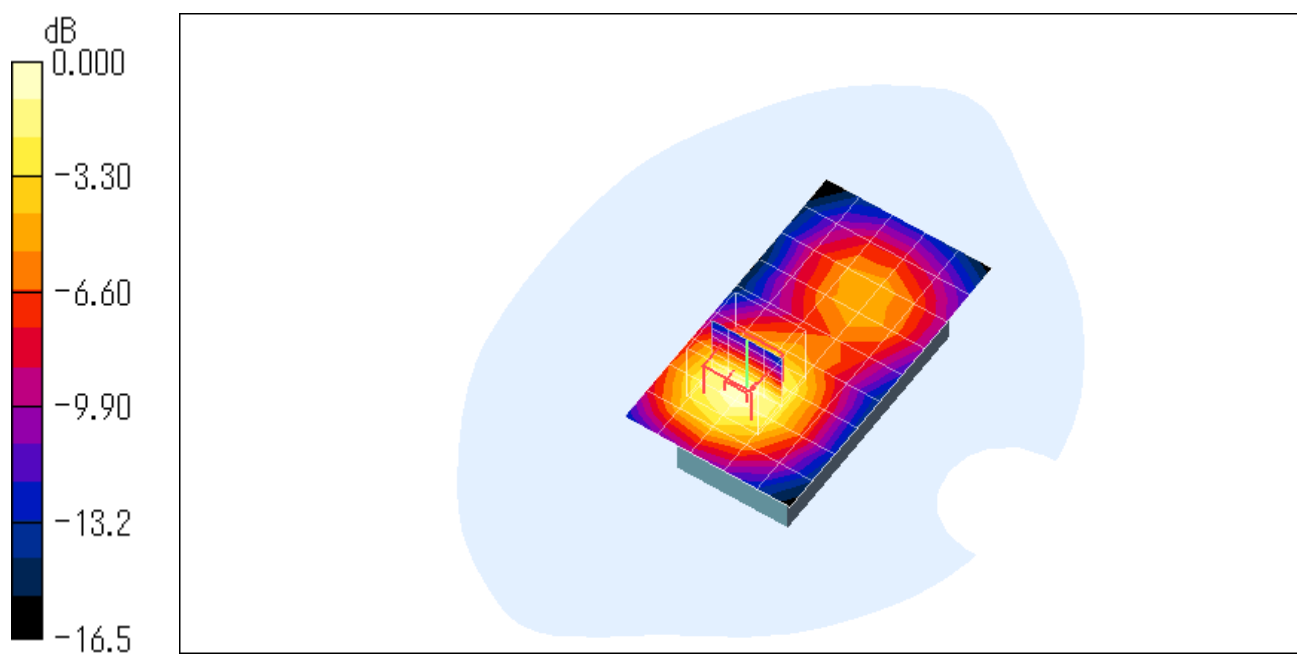
Medium: M1900 Medium parameters used: $f = 1909.8 \text{ MHz}$; $\sigma = 1.57 \text{ mho/m}$; $\epsilon_r = 51.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(4.8, 4.8, 4.8); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1194; Type: QD 000 P40 CA; Serial: 1194
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn/Area Scan (6x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$ Maximum value of SAR (measured) = 0.113 mW/g **Body-worn/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$ Reference Value = 7.46 V/m ; Power Drift = 0.020 dB Peak SAR (extrapolated) = 0.185 W/kg **SAR(1 g) = 0.113 mW/g ; SAR(10 g) = 0.067 mW/g** Maximum value of SAR (measured) = 0.122 mW/g 0 dB = 0.122mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 661ch (1880.00MHz) - GPRS mode

DUT: Cellular Phone; Type: F884i; Serial: 355279010006576

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8

Medium: M1900 Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.57 \text{ mho/m}$; $\epsilon_r = 51.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(4.8, 4.8, 4.8); Calibrated: 2007/11/15
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn508; Calibrated: 2007/11/07
- Phantom: SAM 1194; Type: QD 000 P40 CA; Serial: 1194
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn/Area Scan (6x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.112 mW/g

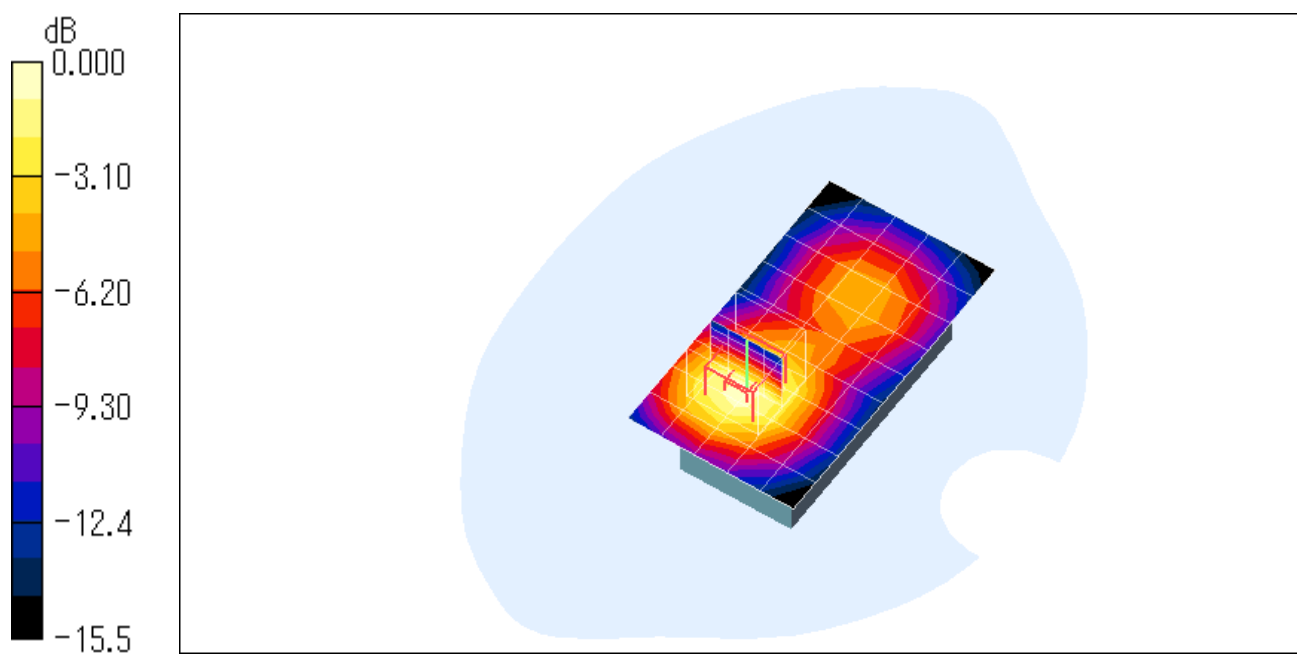
Body-worn/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 7.53 V/m ; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 0.183 W/kg

SAR(1 g) = 0.114 mW/g ; SAR(10 g) = 0.068 mW/g

Maximum value of SAR (measured) = 0.123 mW/g



0 dB = 0.123mW/g



Attachment 3 – Dosimetric E-Field Probe – ET3DV6, S/N: 1679 Calibration Data



Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 108**

Client **JQA (MTT)**

Certificate No: **ET3-1679_Nov07**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1679**

Calibration procedure(s) **QA CAL-01.v6
Calibration procedure for dosimetric E-field probes**

Calibration date: **November 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 $(22 \pm 3)^\circ\text{C}$ 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)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
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 Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

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

Issued: November 15, 2007

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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- 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
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(*f*)_{x,y,z}** = NORM_{x,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*.
- DCP_{x,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 $f \leq 800$ 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 NORM_{x,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.

Probe ET3DV6

SN:1679

Manufactured:	May 7, 2002
Last calibrated:	November 16, 2006
Recalibrated:	November 15, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1679

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.91 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	93 mV
NormY	1.86 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	93 mV
NormZ	1.90 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	93 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		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	10.7	6.6
SAR _{be} [%]	With Correction Algorithm	0.8	0.2

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

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	11.1	7.3
SAR _{be} [%]	With Correction Algorithm	0.3	0.6

Sensor Offset

Probe Tip to Sensor Center **2.7 mm**

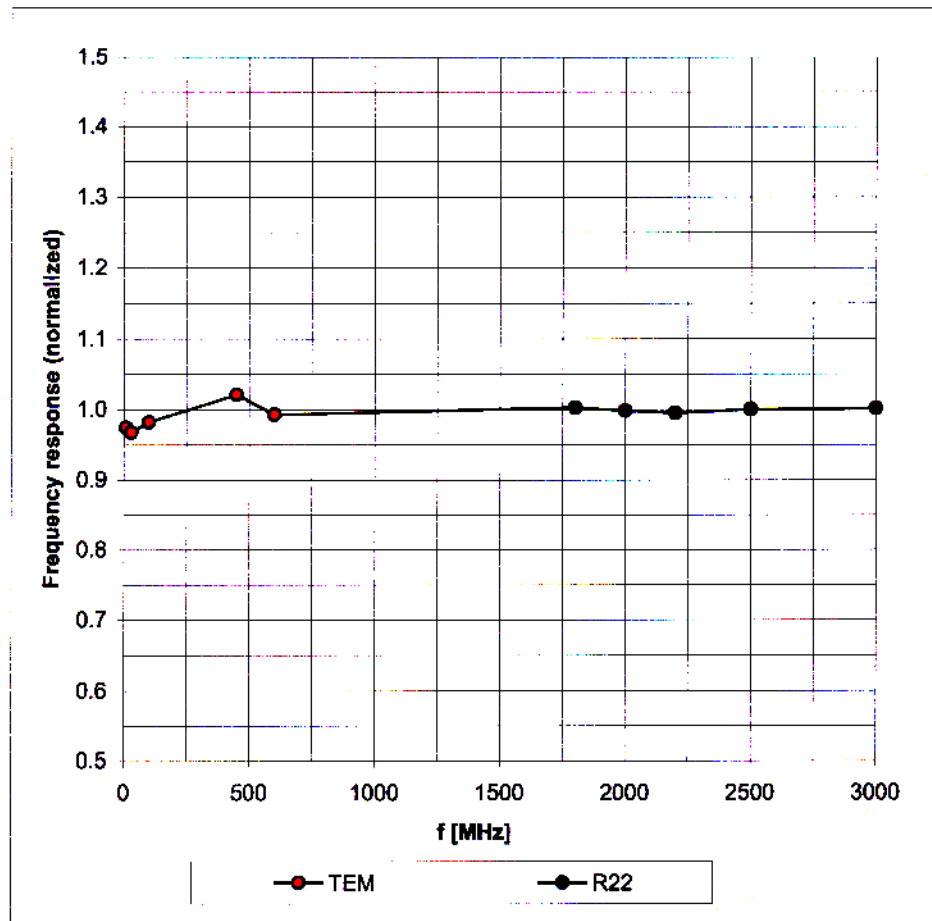
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

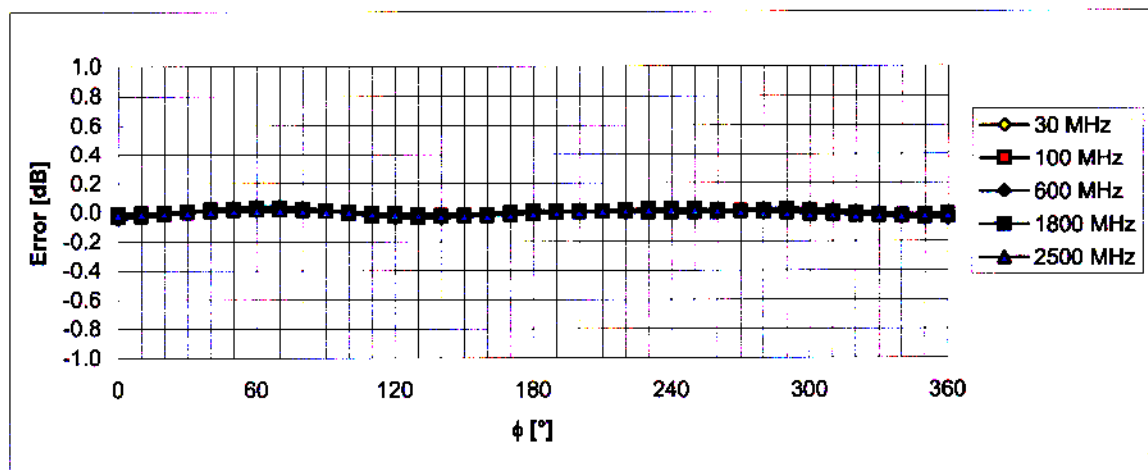
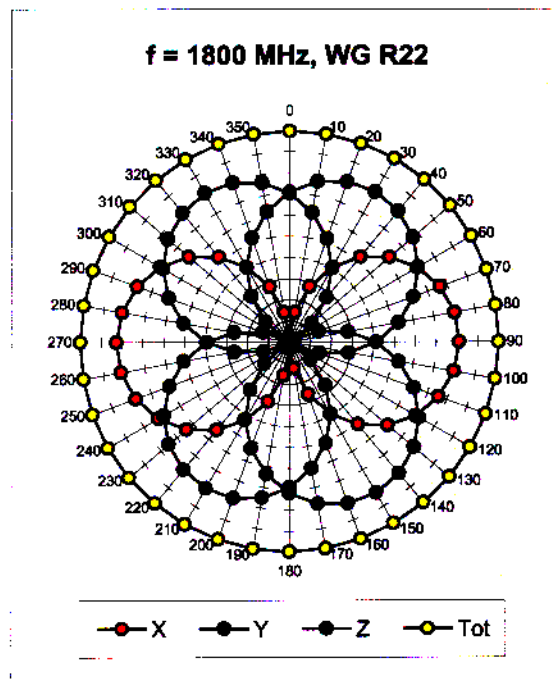
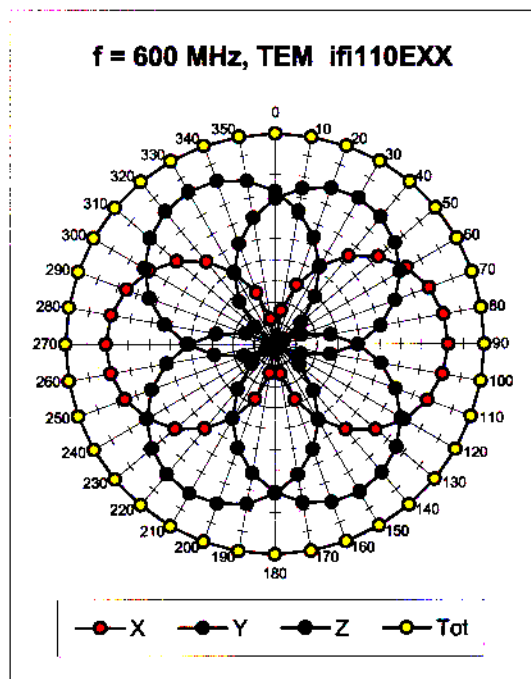
Frequency Response of E-Field

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



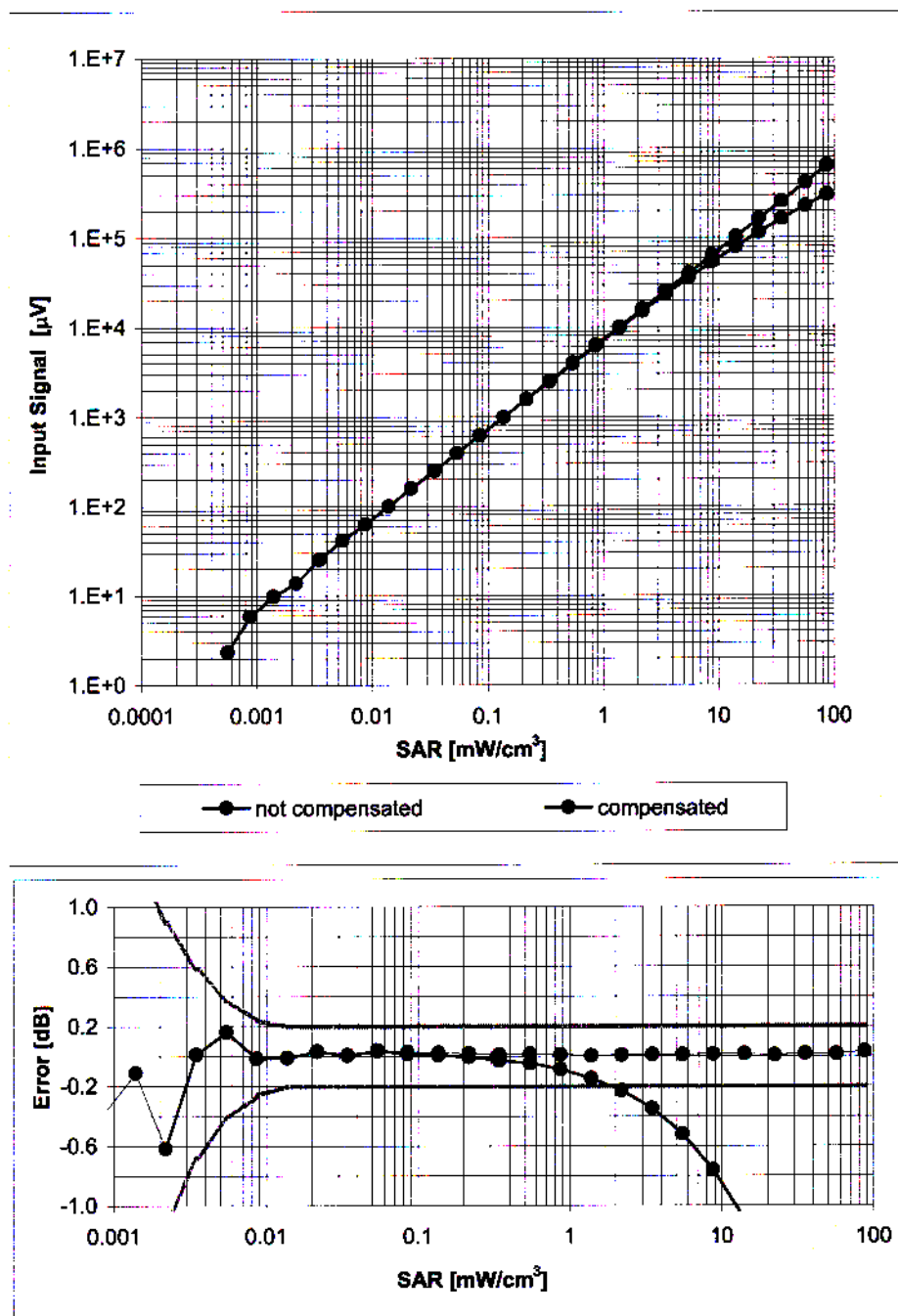
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



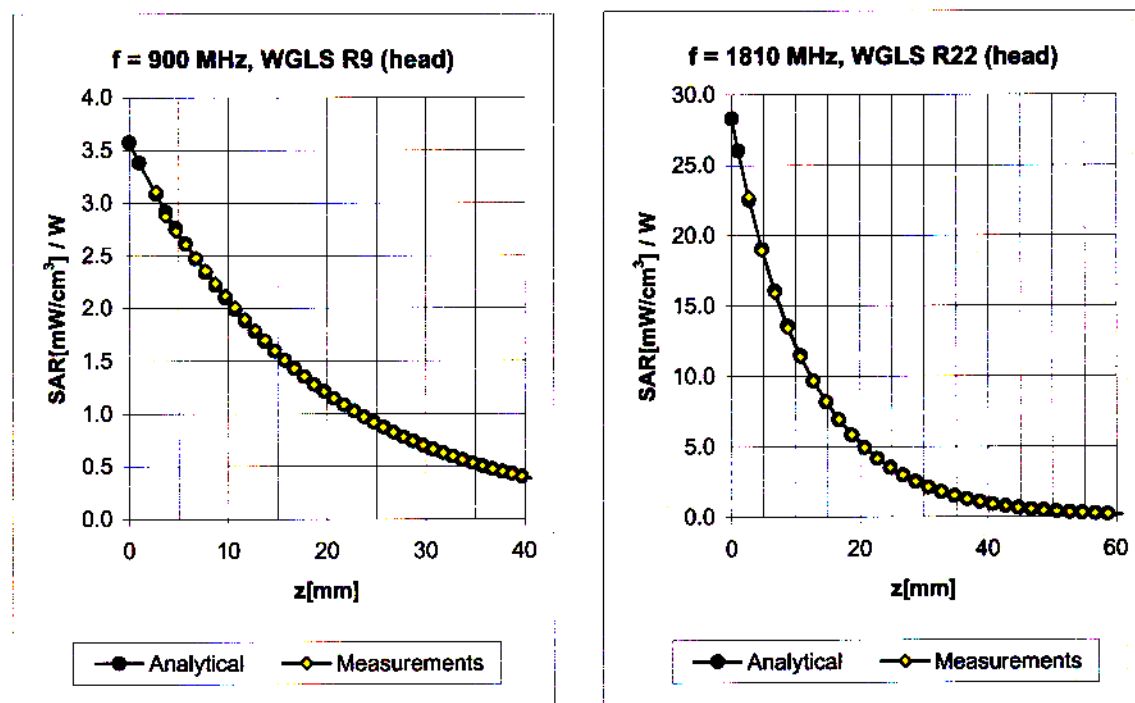
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment

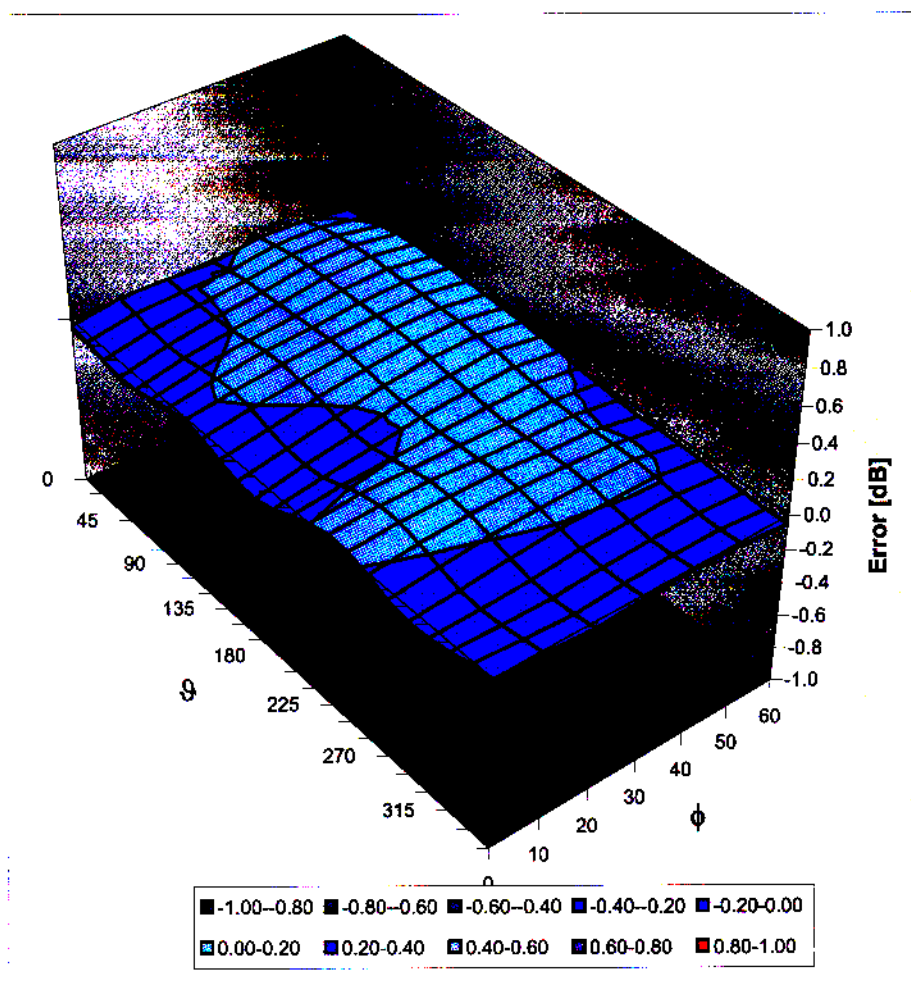


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.56	2.28	6.69 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.60	2.09	5.36 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.63	2.09	5.06 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.63	2.30	4.72 ± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.64	2.11	6.18 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.56	2.70	4.80 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.57	2.54	4.51 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.62	2.35	4.09 ± 11.8% (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.

Deviation from Isotropy in HSL

Error (ϕ , ϑ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)



Attachment 4 – System Validation Dipole – D1800V2, S/N: 2d038 Calibration Data



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Accreditation No.: **SCS 108**

Client **JQA (MTT)**

Certificate No: **D1800V2-2d038_Nov07**

CALIBRATION CERTIFICATE

Object **D1800V2 - SN: 2d038**

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

Calibration date: **November 13, 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 EPM-442A	GB37480704	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN: 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-08
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

Calibrated by: **Claudio Leubler** **Laboratory Technician** **Signature**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: November 15, 2007

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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:

- 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
- 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
- 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:

- 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.

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	38.8 \pm 6 %	1.39 mho/m \pm 6 %
Head TSL temperature during test	(22.0 \pm 0.2) °C	---	—

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	9.56 mW /g
SAR normalized	normalized to 1W	38.2 mW /g
SAR for nominal Head TSL parameters ¹	normalized to 1W	37.7 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.06 mW /g
SAR normalized	normalized to 1W	20.2 mW /g
SAR for nominal Head TSL parameters ¹	normalized to 1W	20.0 mW / g \pm 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.5 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	9.53 mW /g
SAR normalized	normalized to 1W	38.1 mW /g
SAR for nominal Body TSL parameters ²	normalized to 1W	38.9 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.11 mW /g
SAR normalized	normalized to 1W	20.4 mW /g
SAR for nominal Body TSL parameters ²	normalized to 1W	20.6 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.7 j Ω - 4.5 j Ω
Return Loss	- 25.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.7 j Ω - 4.0 j Ω
Return Loss	- 21.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 28, 2002

DASY4 Validation Report for Head TSL

Date/Time: 05.11.2007 12:17:49

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: SN:2d038

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.99, 4.99, 4.99); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

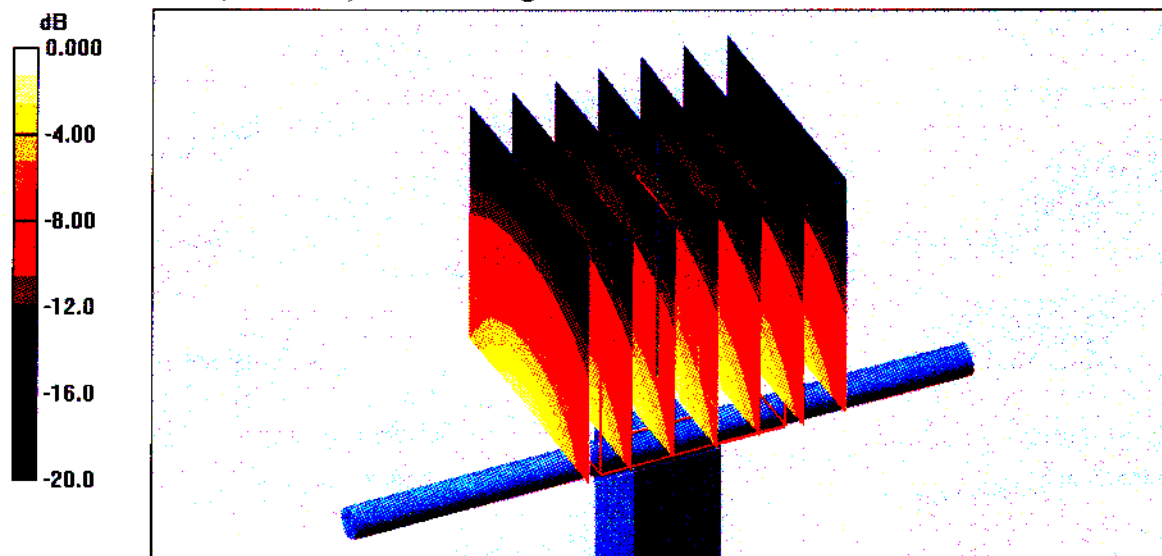
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.2 V/m; Power Drift = 0.014 dB

Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 9.56 mW/g; SAR(10 g) = 5.06 mW/g

Maximum value of SAR (measured) = 10.7 mW/g



0 dB = 10.7mW/g

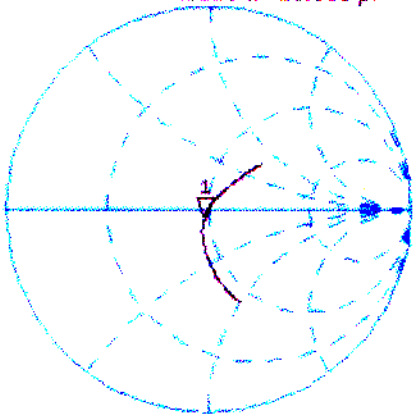
Impedance Measurement Plot for Head TSL

5 Nov 2007 11:47:55
[CH1] S11 1 U FS 1: 47.701 \angle -4.5215 \angle 19.555 pF 1 800.000 000 MHz

*
Del
CA

Avg
16

↑

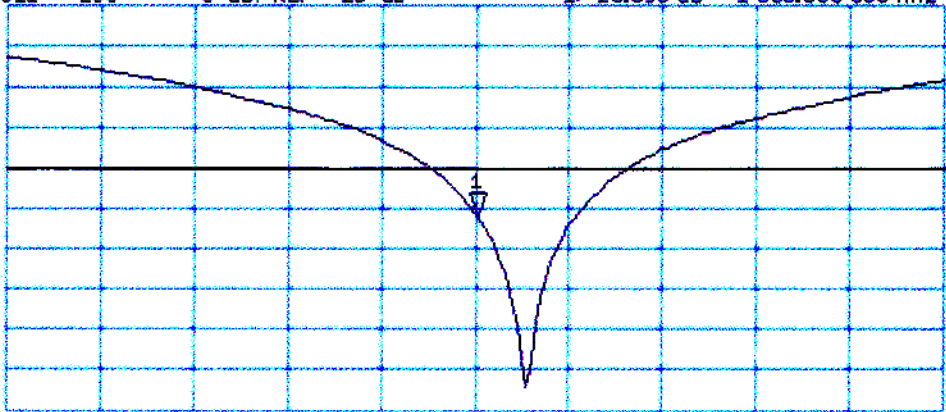


CH2 S11 LOG 5 dB/REF -20 dB 1: -25.698 dB 1 800.000 000 MHz

CA

Avg
16

↑



CENTER 1 800.000 000 MHz SPAN 400.000 000 MHz

DASY4 Validation Report for Body TSL

Date/Time: 13.11.2007 11:43:39

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d038

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.56, 4.56, 4.56); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

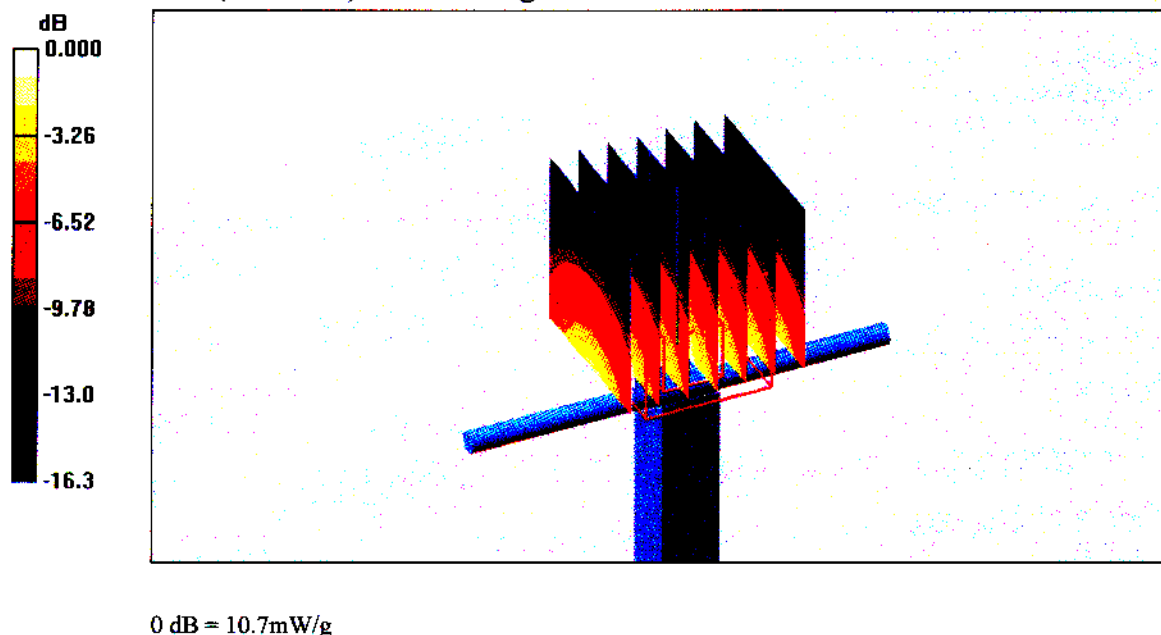
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.3 V/m; Power Drift = -0.012 dB

Peak SAR (extrapolated) = 16.4 W/kg

SAR(1 g) = 9.53 mW/g; SAR(10 g) = 5.11 mW/g

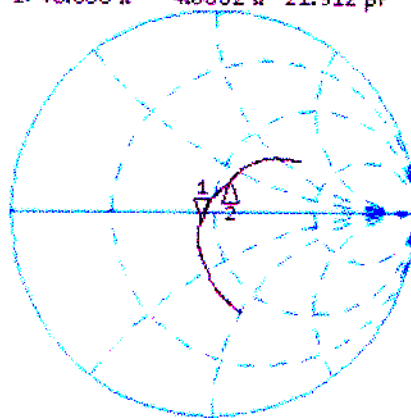
Maximum value of SAR (measured) = 10.7 mW/g



Impedance Measurement Plot for Body TSL

13 Nov 2007 10:24:26
 CH1 S11 1 U FS 1: 43.656 Ω -4.0352 Ω 21.912 pF 1 800.000 000 MHz

*
 Del
 Cor



CH1 Markers
 2: 55.543 Ω
 16.119 Ω
 1.90000 GHz

Avg
 16

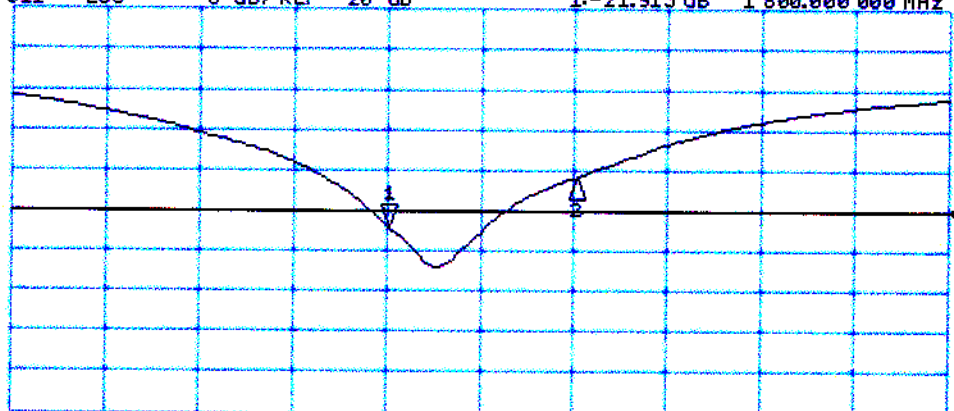
↑

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.915 dB 1 800.000 000 MHz

Cor

Avg
 16

↑



CH2 Markers
 2: -15.935 dB
 1.90000 GHz

START 1 600.000 000 MHz

STOP 2 100.000 000 MHz