



Attachment 1 – System Validation Plots

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

System Validation (Head 900 MHz)**DUT: Dipole 900 MHz; Type: D900V2; Serial: 153**

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

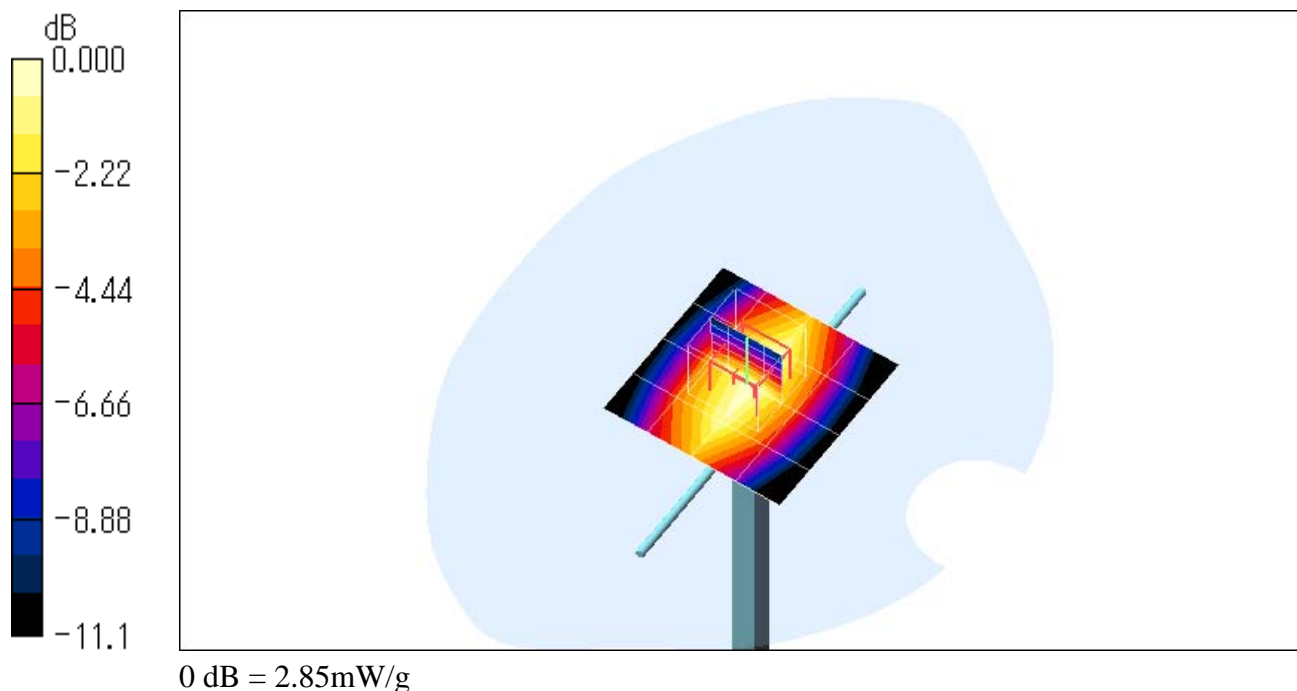
Medium: HSL900 Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 0.951 \text{ mho/m}$; $\epsilon_r = 41.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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) = 2.87 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 = 57.8 V/m ; Power Drift = -0.006 dB Peak SAR (extrapolated) = 3.70 W/kg **SAR(1 g) = 2.63 mW/g ; SAR(10 g) = 1.72 mW/g** Maximum value of SAR (measured) = 2.85 mW/g 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

System Validation (Body 900 MHz)**DUT: Dipole 900 MHz; Type: D900V2; Serial: 153**

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

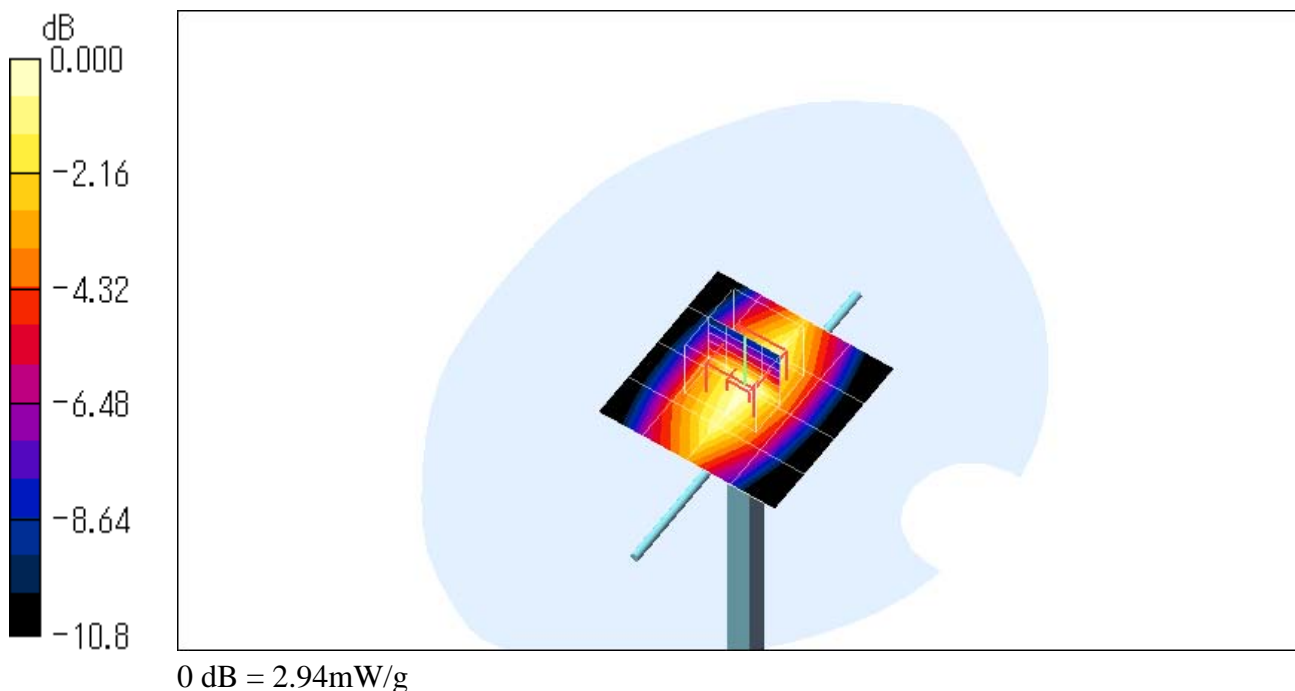
Medium: M900 Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 53.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.18, 6.18, 6.18); 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) = 2.92 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 = 56.5 V/m ; Power Drift = -0.020 dB Peak SAR (extrapolated) = 3.73 W/kg **SAR(1 g) = 2.7 mW/g ; SAR(10 g) = 1.78 mW/g** Maximum value of SAR (measured) = 2.94 mW/g 



Attachment 2 – SAR Test Plots

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 4132ch (826.4MHz)

DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300

Communication System: WCDMA; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium: HSL900 Medium parameters used: $f = 826.4 \text{ MHz}$; $\sigma = 0.892 \text{ mho/m}$; $\epsilon_r = 42.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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) = 0.415 mW/g

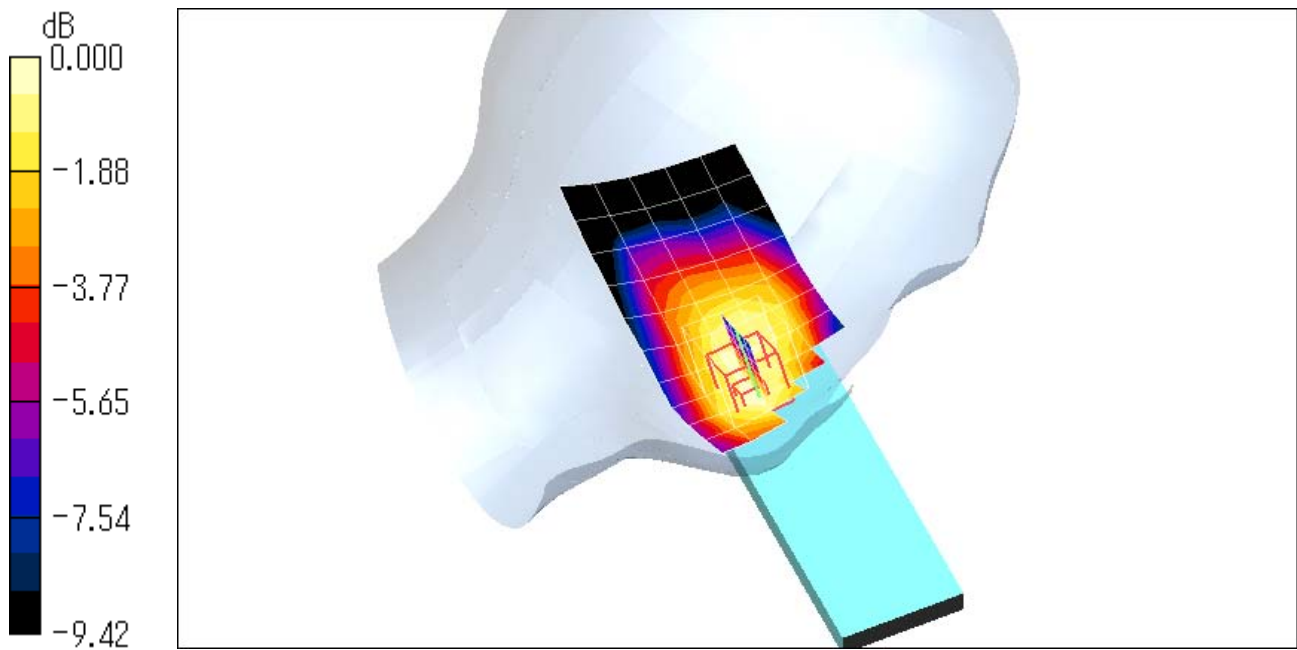
Cheek/Touch Position/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 21.3 V/m ; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 0.540 W/kg

SAR(1 g) = 0.384 mW/g ; SAR(10 g) = 0.265 mW/g

Maximum value of SAR (measured) = 0.410 mW/g



Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 4132ch (826.4MHz)**DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300**

Communication System: WCDMA; Frequency: 826.4 MHz; Duty Cycle: 1:1

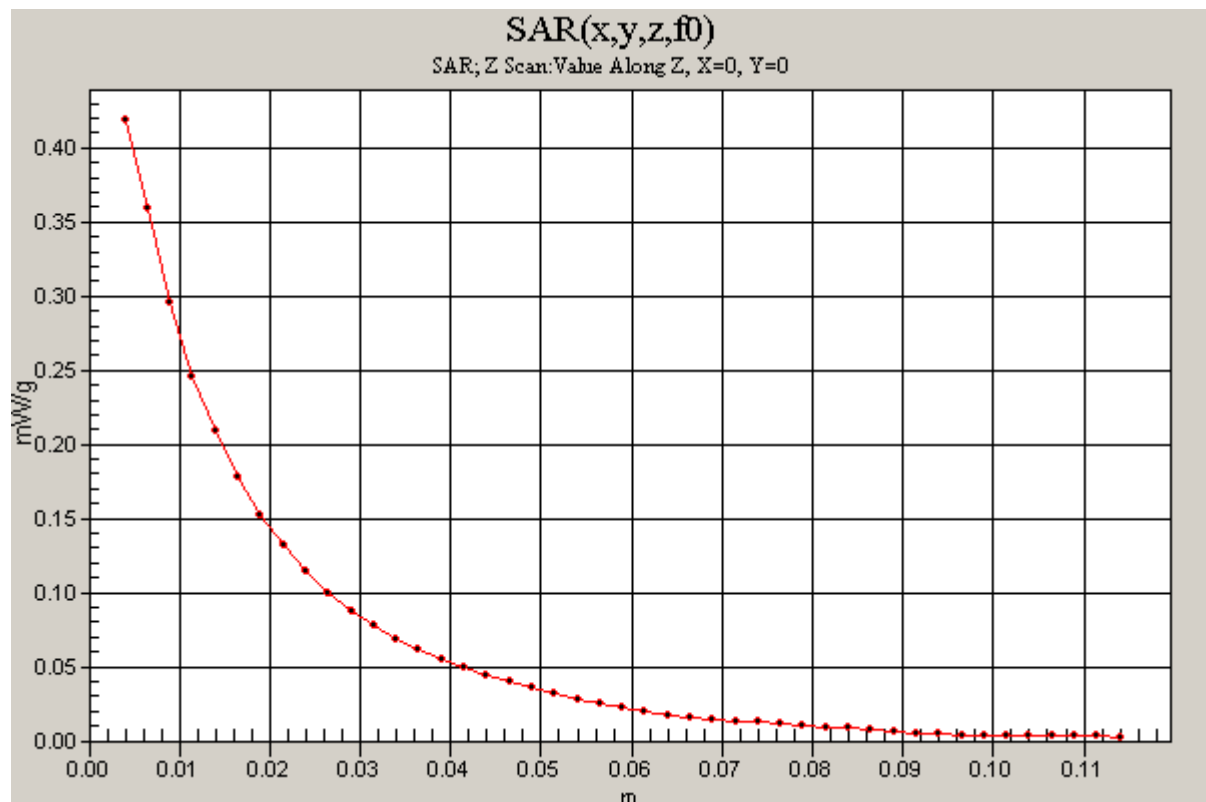
Medium: HSL900 Medium parameters used: $f = 826.4 \text{ MHz}$; $\sigma = 0.892 \text{ mho/m}$; $\epsilon_r = 42.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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) = 0.419 mW/g 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 4182ch (836.4MHz)**DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300**

Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1

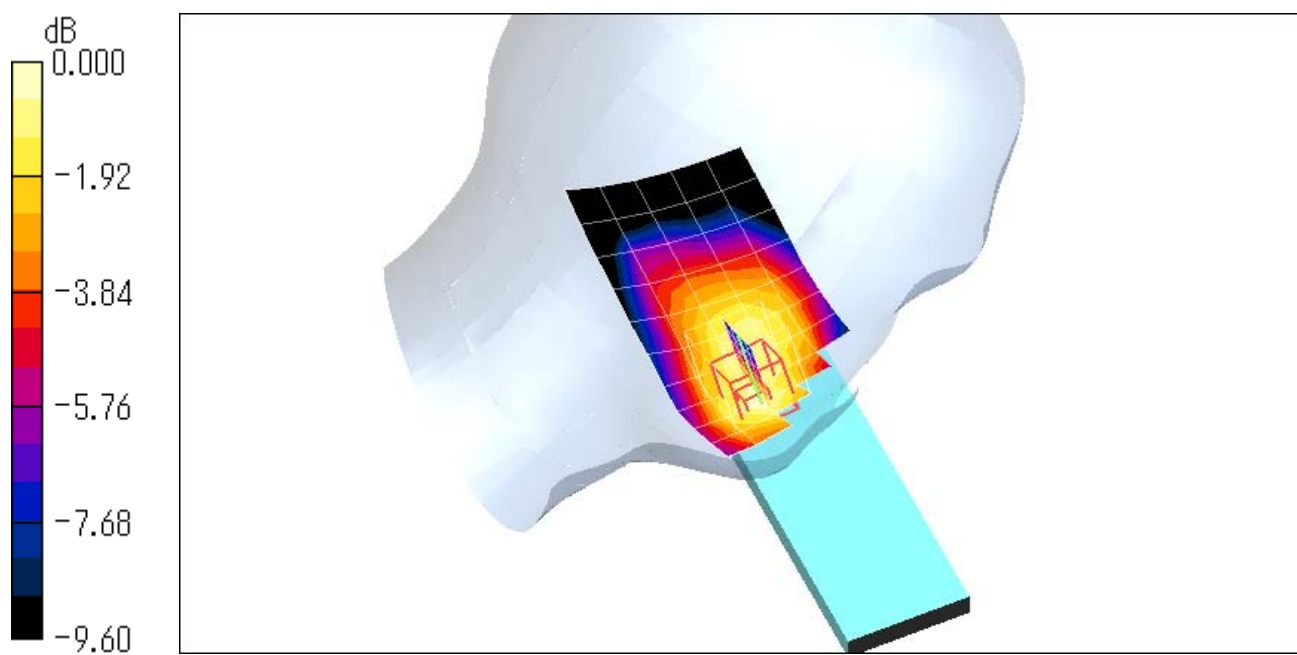
Medium: HSL900 Medium parameters used: $f = 836.4 \text{ MHz}$; $\sigma = 0.892 \text{ mho/m}$; $\epsilon_r = 42.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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) = 0.374 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 = 20.0 V/m ; Power Drift = -0.085 dB Peak SAR (extrapolated) = 0.490 W/kg **SAR(1 g) = 0.350 mW/g ; SAR(10 g) = 0.238 mW/g** Maximum value of SAR (measured) = 0.378 mW/g 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Cheek/Touch 4233ch (846.6MHz)

DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: HSL900 Medium parameters used: $f = 846.6 \text{ MHz}$; $\sigma = 0.892 \text{ mho/m}$; $\epsilon_r = 42.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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: $dx=15\text{mm}$, $dy=15\text{mm}$

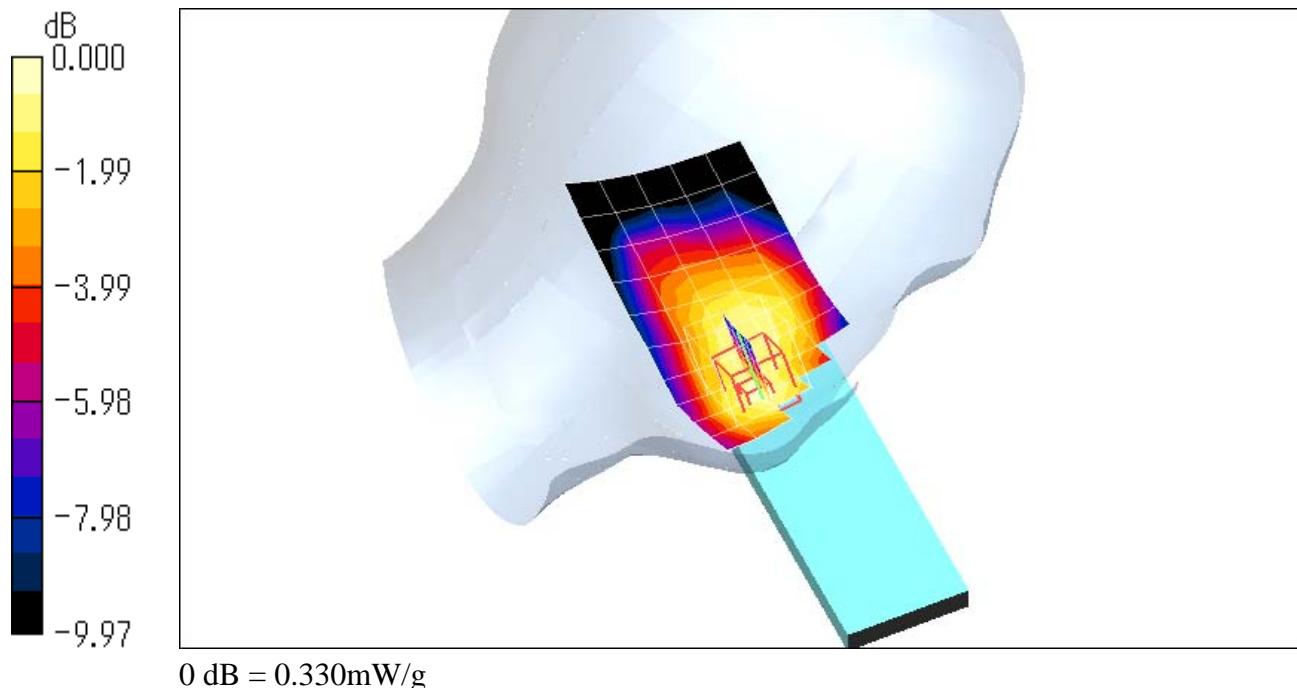
Maximum value of SAR (measured) = 0.330 mW/g

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

Reference Value = 18.8 V/m ; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.442 W/kg

SAR(1 g) = 0.307 mW/g ; SAR(10 g) = 0.207 mW/g



Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Left Head, Ear/Tilt 4182ch (836.4MHz)**DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300**

Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1

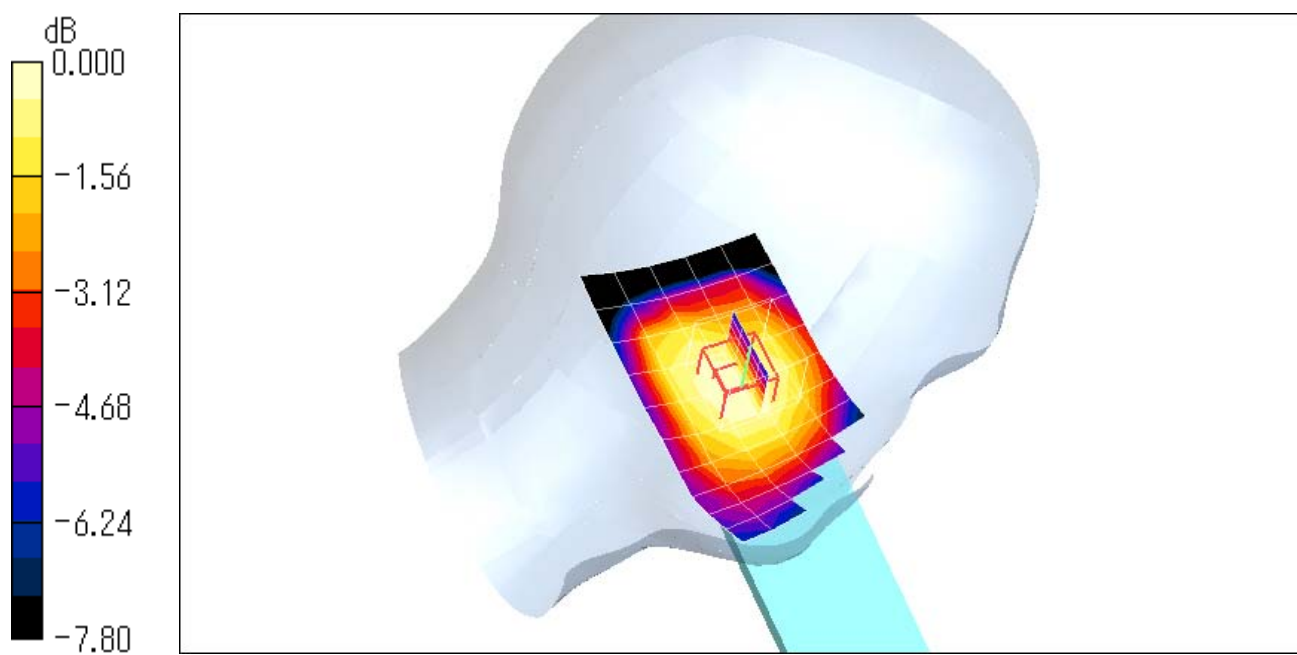
Medium: HSL900 Medium parameters used: $f = 836.4 \text{ MHz}$; $\sigma = 0.892 \text{ mho/m}$; $\epsilon_r = 42.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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) = 0.148 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 = 12.6 V/m ; Power Drift = -0.083 dB Peak SAR (extrapolated) = 0.166 W/kg **SAR(1 g) = 0.143 mW/g ; SAR(10 g) = 0.113 mW/g** Maximum value of SAR (measured) = 0.149 mW/g 0 dB = 0.149 mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Right Head, Cheek/Touch 4182ch (836.4MHz)**DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300**

Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1

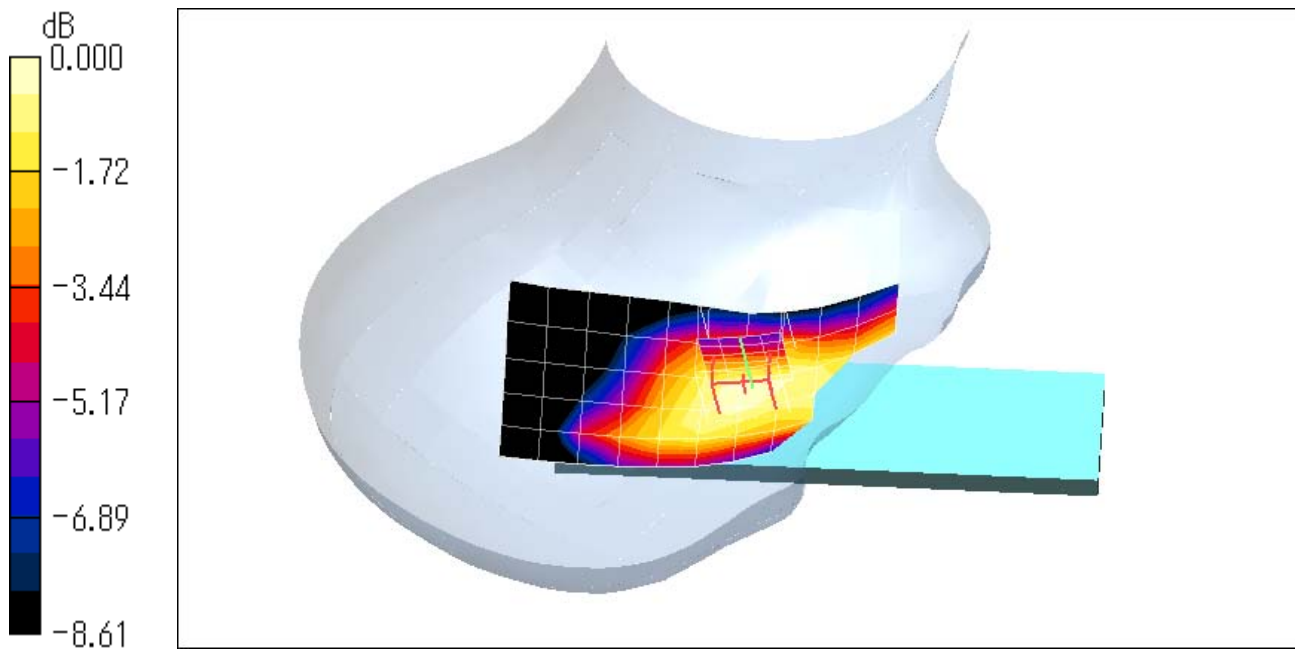
Medium: HSL900 Medium parameters used: $f = 836.4 \text{ MHz}$; $\sigma = 0.892 \text{ mho/m}$; $\epsilon_r = 42.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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) = 0.325 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 = 19.9 V/m ; Power Drift = -0.038 dB Peak SAR (extrapolated) = 0.388 W/kg **SAR(1 g) = 0.321 mW/g ; SAR(10 g) = 0.251 mW/g** Maximum value of SAR (measured) = 0.341 mW/g 

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Right Head, Ear/Tilt 4182ch (836.4MHz)**DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300**

Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1

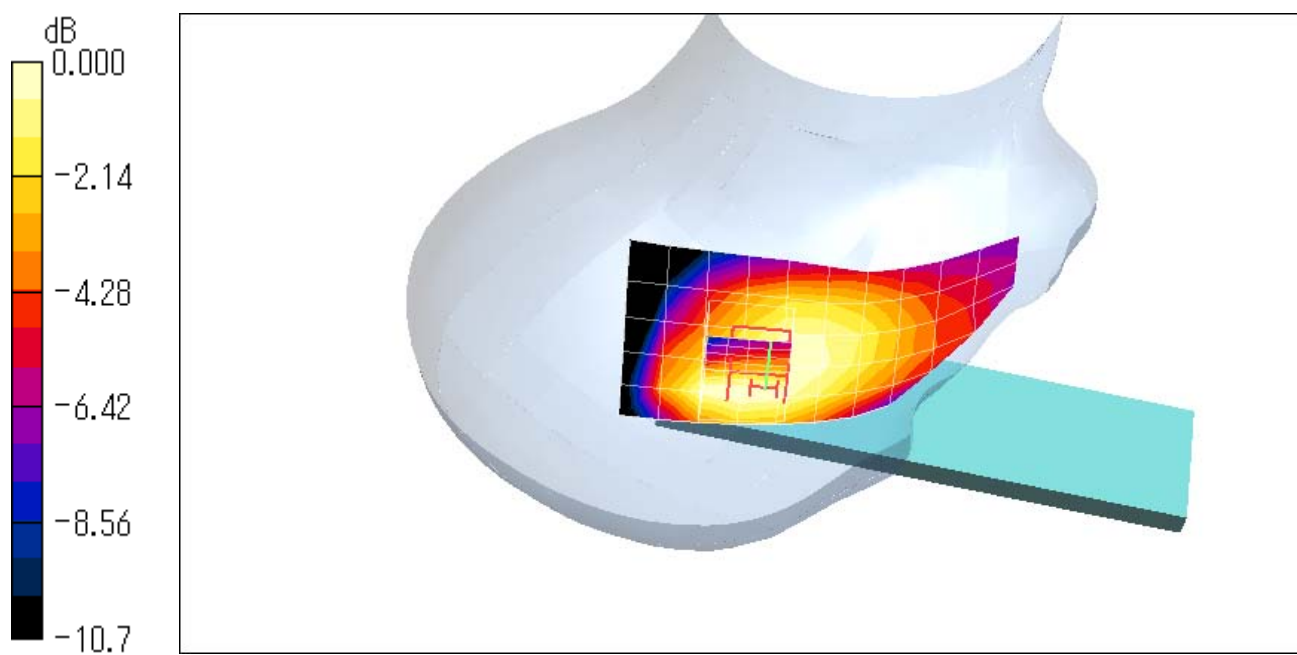
Medium: HSL900 Medium parameters used: $f = 836.4 \text{ MHz}$; $\sigma = 0.892 \text{ mho/m}$; $\epsilon_r = 42.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.69, 6.69, 6.69); 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) = 0.160 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 = 12.9 V/m ; Power Drift = -0.007 dB Peak SAR (extrapolated) = 0.196 W/kg **SAR(1 g) = 0.149 mW/g ; SAR(10 g) = 0.111 mW/g** Maximum value of SAR (measured) = 0.158 mW/g 0 dB = 0.158mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 4132ch (826.4MHz)

DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300

Communication System: WCDMA; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium: M900 Medium parameters used: $f = 826.4 \text{ MHz}$; $\sigma = 0.953 \text{ mho/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.18, 6.18, 6.18); 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

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

Maximum value of SAR (measured) = 0.415 mW/g

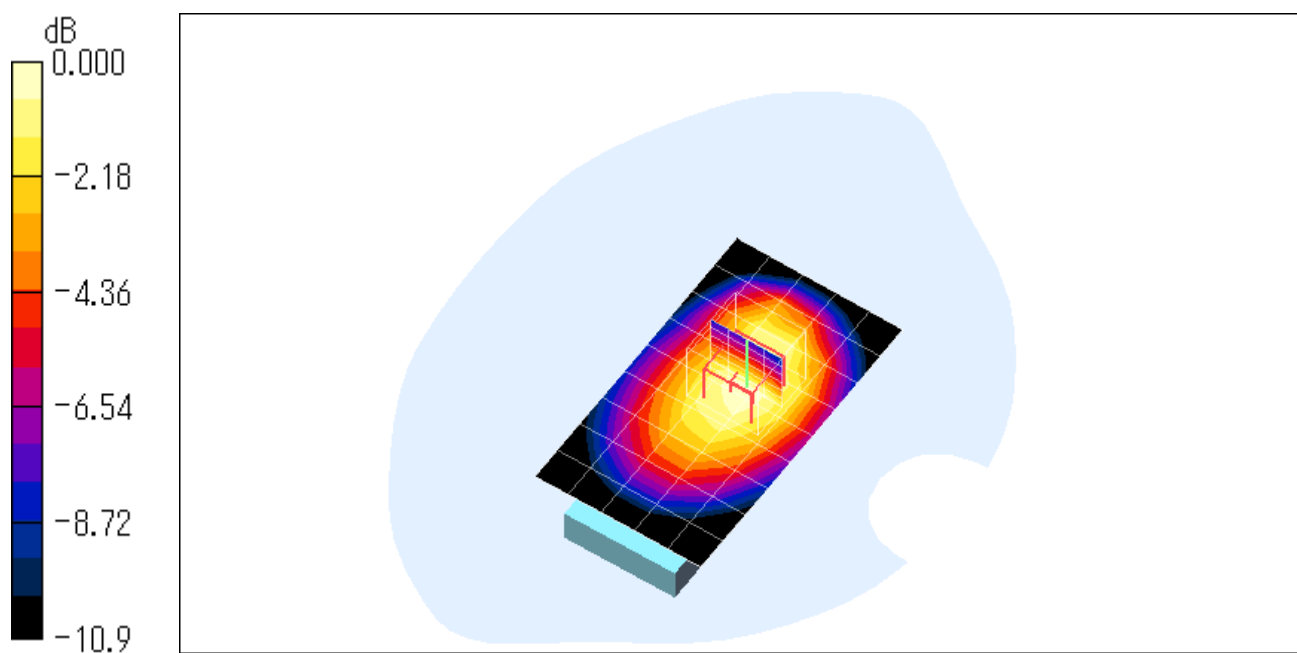
Body-worn/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 20.1 V/m ; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 0.516 W/kg

SAR(1 g) = 0.399 mW/g ; SAR(10 g) = 0.283 mW/g

Maximum value of SAR (measured) = 0.428 mW/g



Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 4182ch (836.4MHz)

DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300

Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium: M900 Medium parameters used: $f = 836.4 \text{ MHz}$; $\sigma = 0.953 \text{ mho/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.18, 6.18, 6.18); 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

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

Maximum value of SAR (measured) = 0.507 mW/g

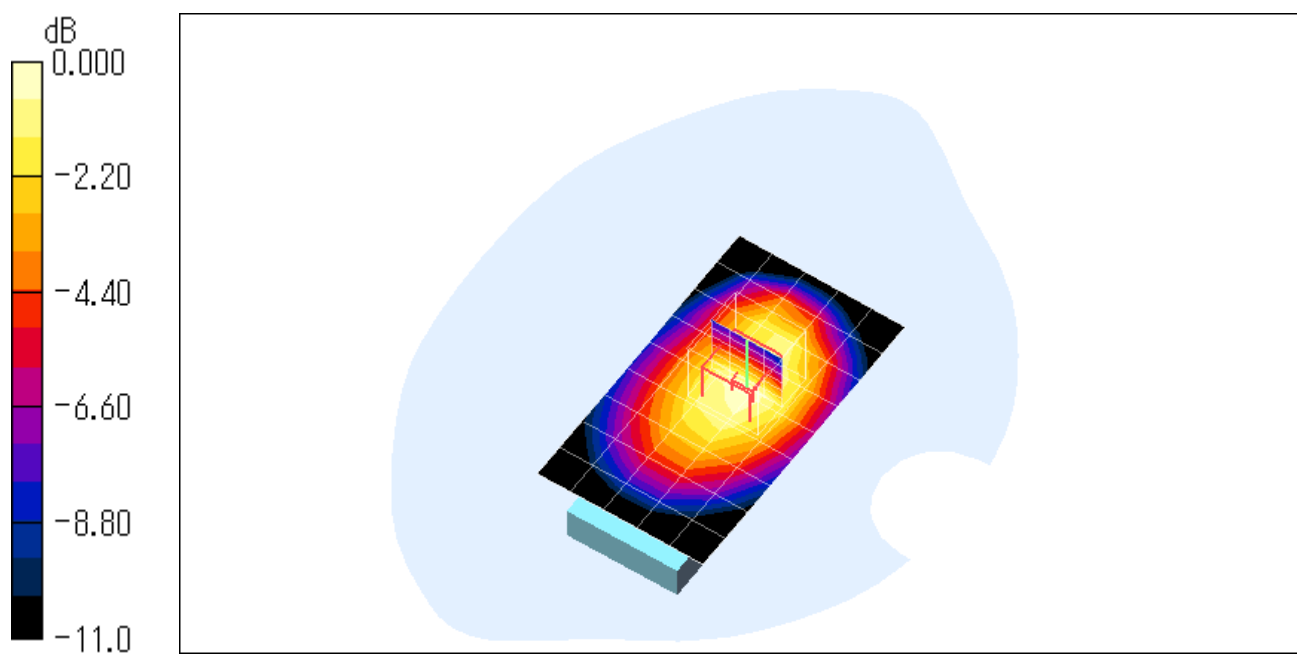
Body-worn/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 21.9 V/m ; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 0.623 W/kg

SAR(1 g) = 0.484 mW/g ; SAR(10 g) = 0.343 mW/g

Maximum value of SAR (measured) = 0.520 mW/g



0 dB = 0.520 mW/g

Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 4182ch (836.4MHz)

DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300

Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium: M900 Medium parameters used: $f = 836.4 \text{ MHz}$; $\sigma = 0.953 \text{ mho/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

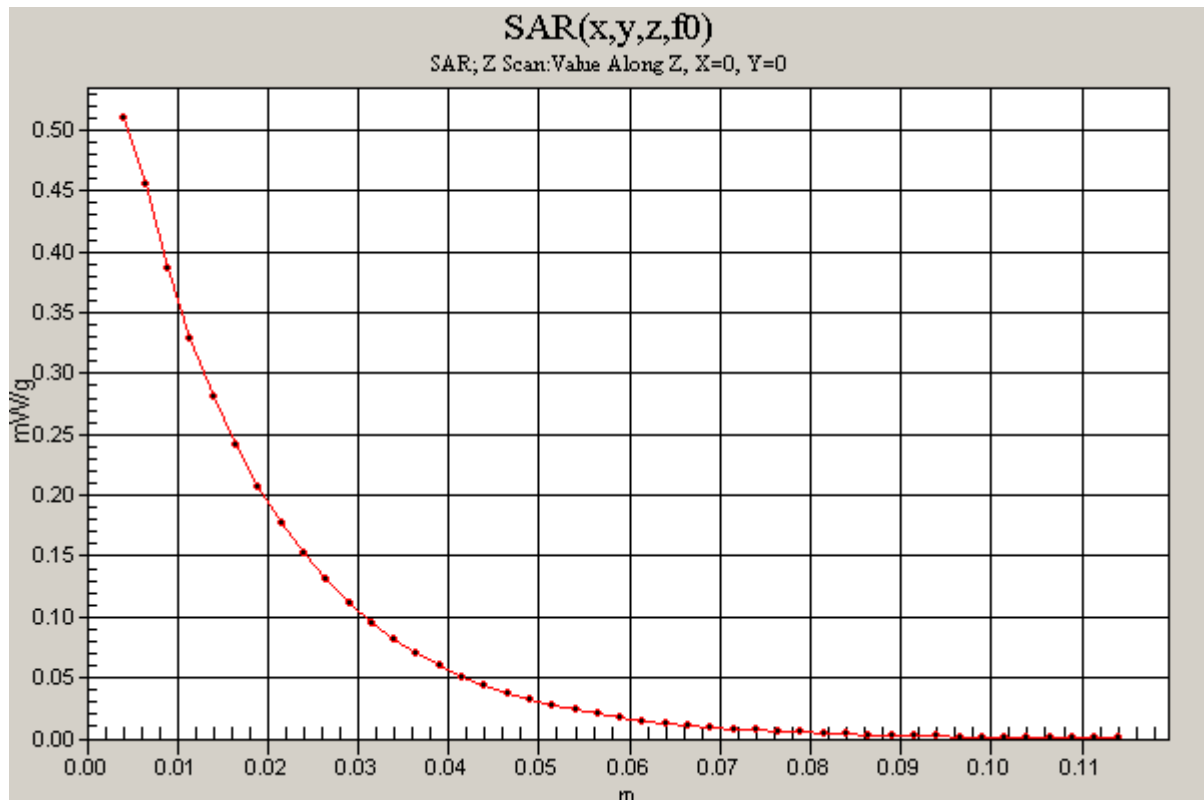
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.18, 6.18, 6.18); 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

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) = 0.510 mW/g



Test Laboratory: JAPAN QUALITY ASSURANCE ORGANIZATION

Body-worn 4233ch (846.6MHz)

DUT: Cellular Phone; Type: F-02A; Serial: 353708020002300

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: M900 Medium parameters used: $f = 846.6 \text{ MHz}$; $\sigma = 0.953 \text{ mho/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1679; ConvF(6.18, 6.18, 6.18); 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

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

Maximum value of SAR (measured) = 0.450 mW/g

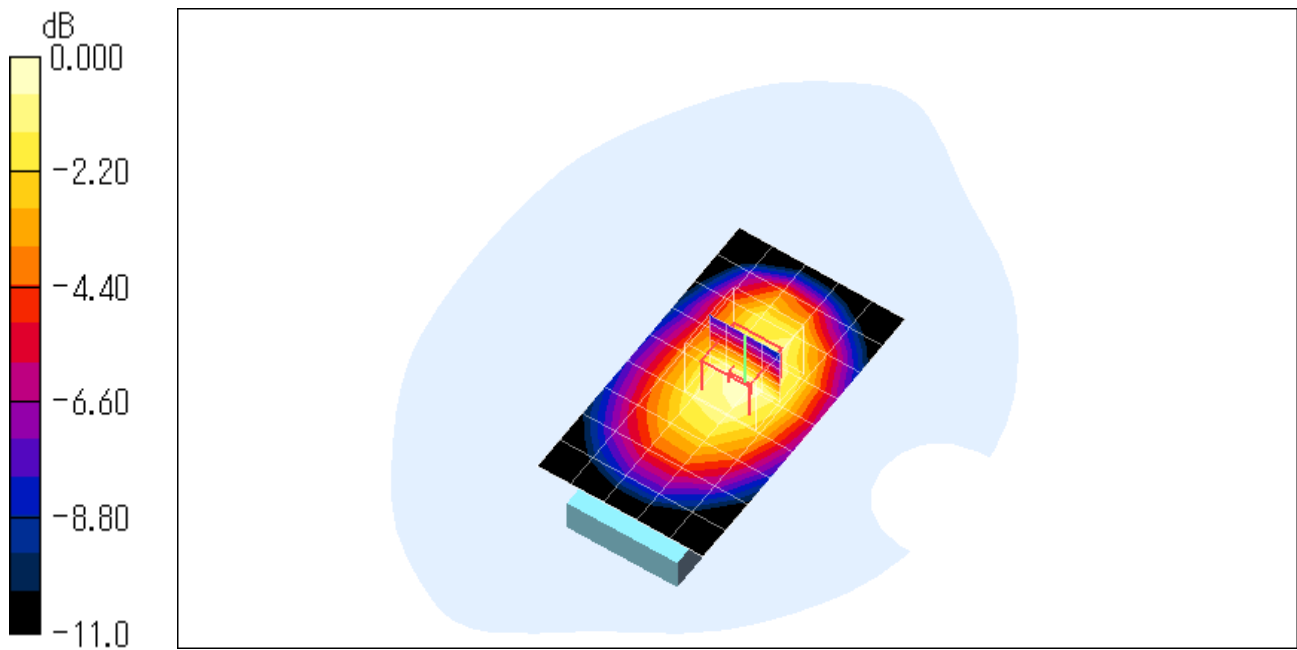
Body-worn/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 21.3 V/m ; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 0.563 W/kg

SAR(1 g) = 0.435 mW/g ; SAR(10 g) = 0.309 mW/g

Maximum value of SAR (measured) = 0.465 mW/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

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
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**

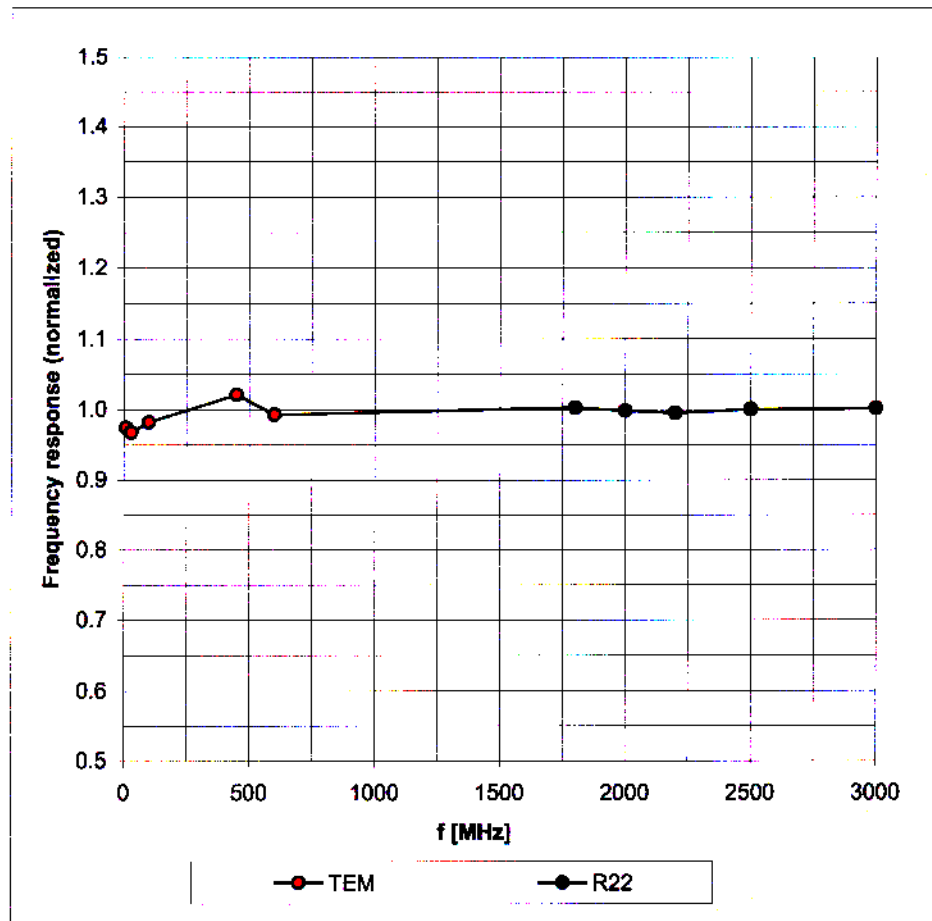
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^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.

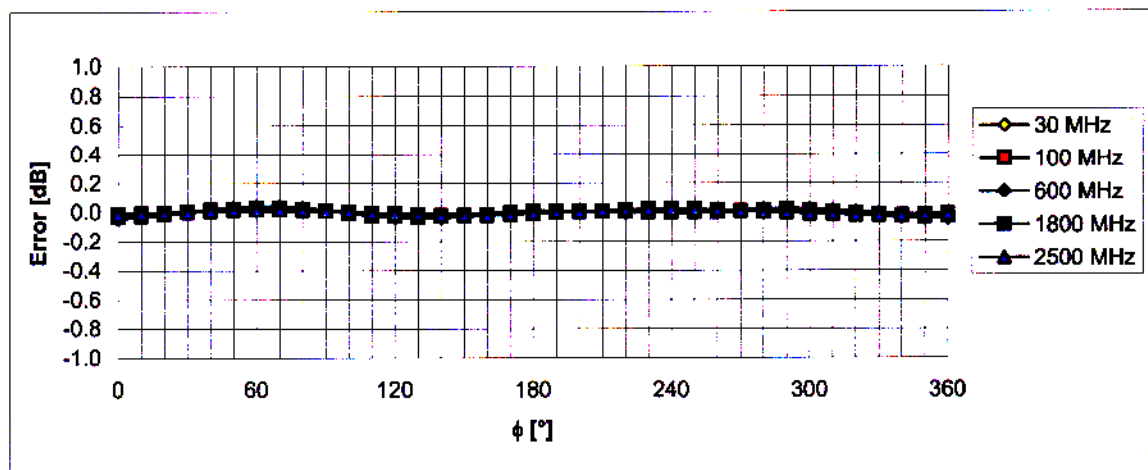
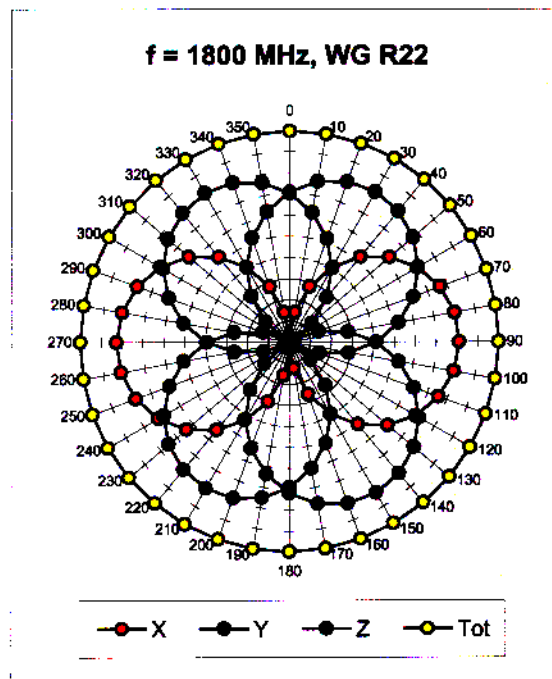
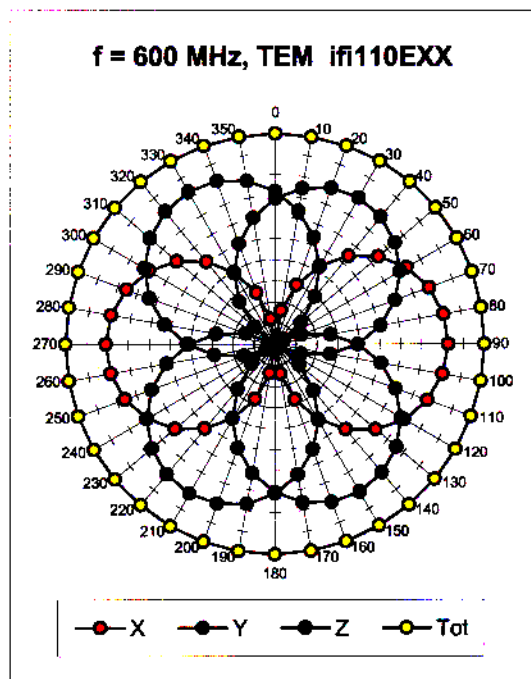
Frequency Response of E-Field

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



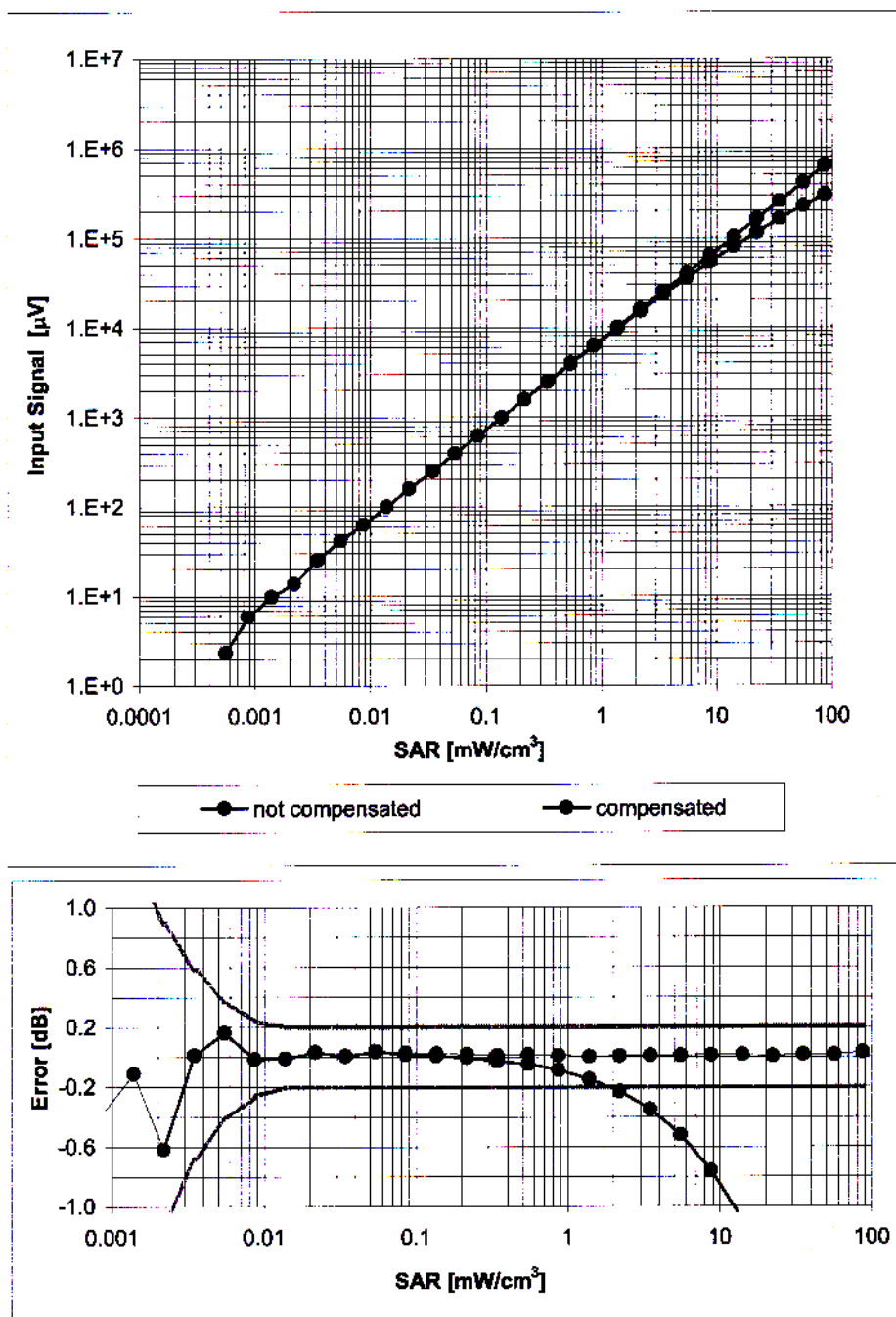
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



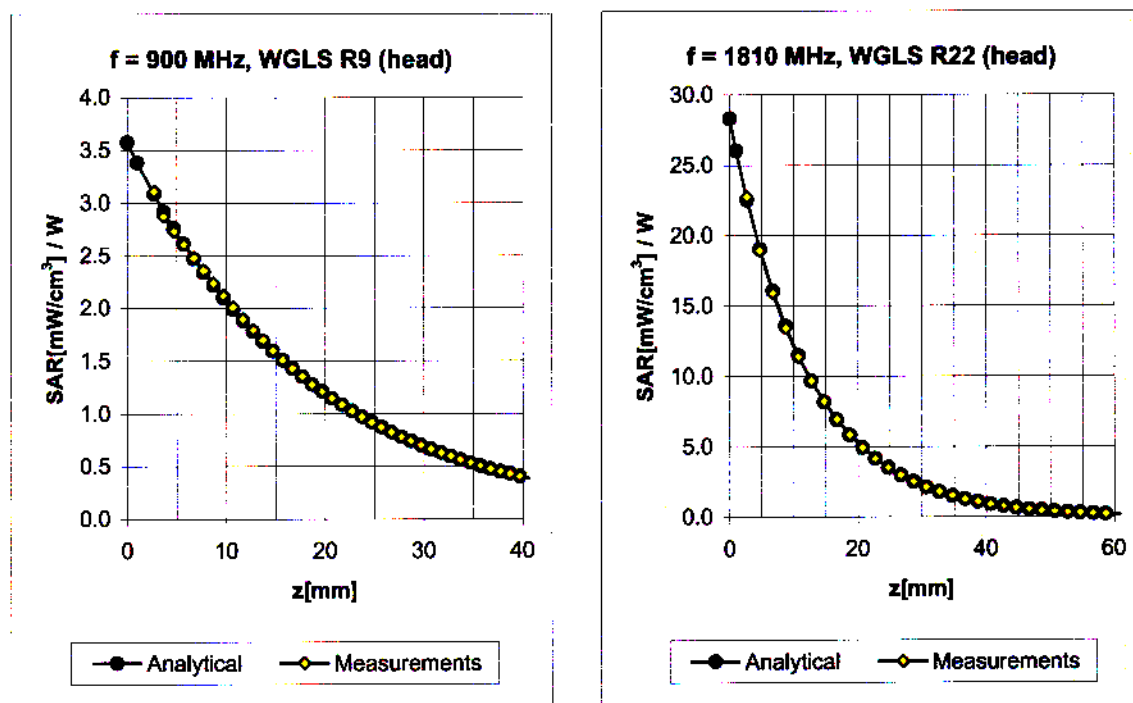
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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

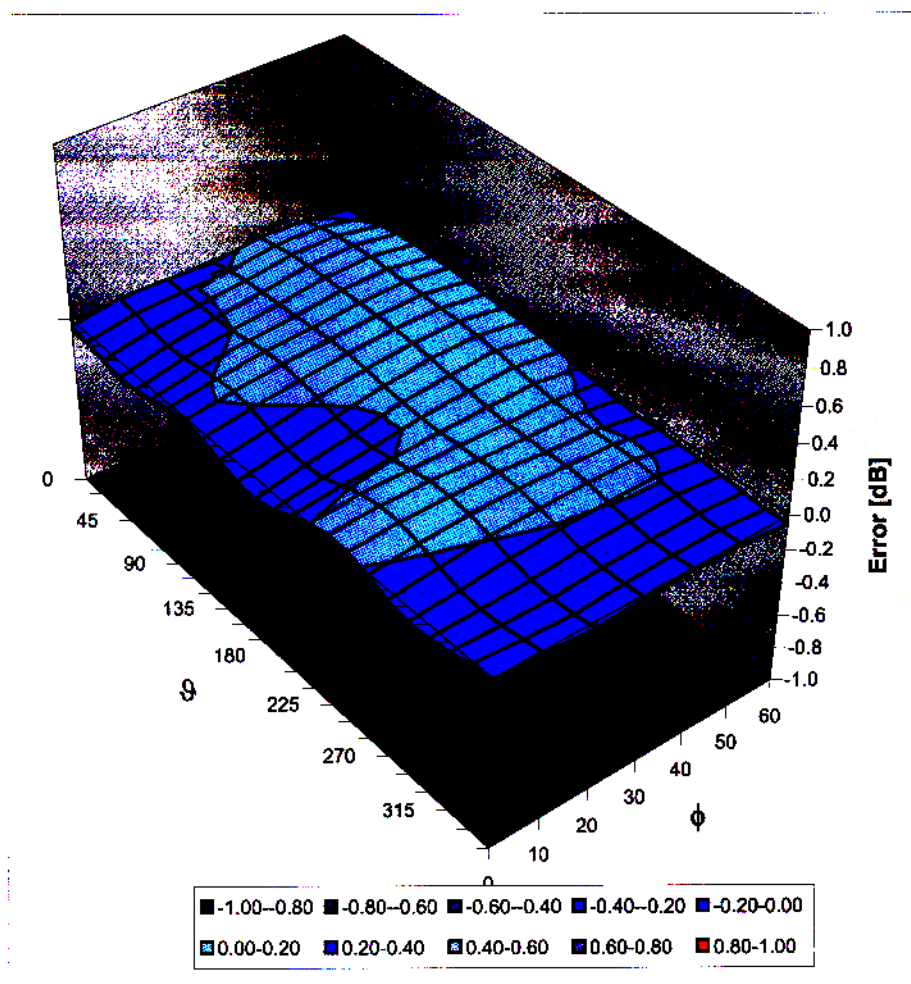


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.56	2.28	6.69 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.60	2.09	5.36 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.63	2.09	5.06 ± 11.0% (k=2)
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 – D900V2, S/N: 153 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: **D900V2-153_Nov07**

CALIBRATION CERTIFICATE

Object **D900V2 - SN: 153**

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

Calibration date: **November 12, 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-09
RF generator R&S SMT-06	100005	04-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

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	

	Name	Function
Approved by:	Katja Pokovic	Technical Manager

Issued: November 14, 2007

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

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 V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	39.6 \pm 6 %	0.94 mho/m \pm 6 %
Head TSL temperature during test	(21.3 \pm 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.76 mW / g
SAR normalized	normalized to 1W	11.0 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	10.9 mW /g \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.77 mW / g
SAR normalized	normalized to 1W	7.08 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	7.00 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	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.06 mho/m ± 6 %
Body TSL temperature during test	(21.6 ± 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	2.81 mW / g
SAR normalized	normalized to 1W	11.2 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	11.1 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.82 mW / g
SAR normalized	normalized to 1W	7.28 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	7.21 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	49.1 Ω - 7.1 j Ω
Return Loss	- 22.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.0 Ω - 8.7 j Ω
Return Loss	- 19.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.393 ns
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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	March 1, 2002

DASY4 Validation Report for Head TSL

Date/Time: 07.11.2007 15:53:46

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:153

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: HSL 900 MHz;

Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 0.939 \text{ mho/m}$; $\epsilon_r = 39.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.93, 5.93, 5.93); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

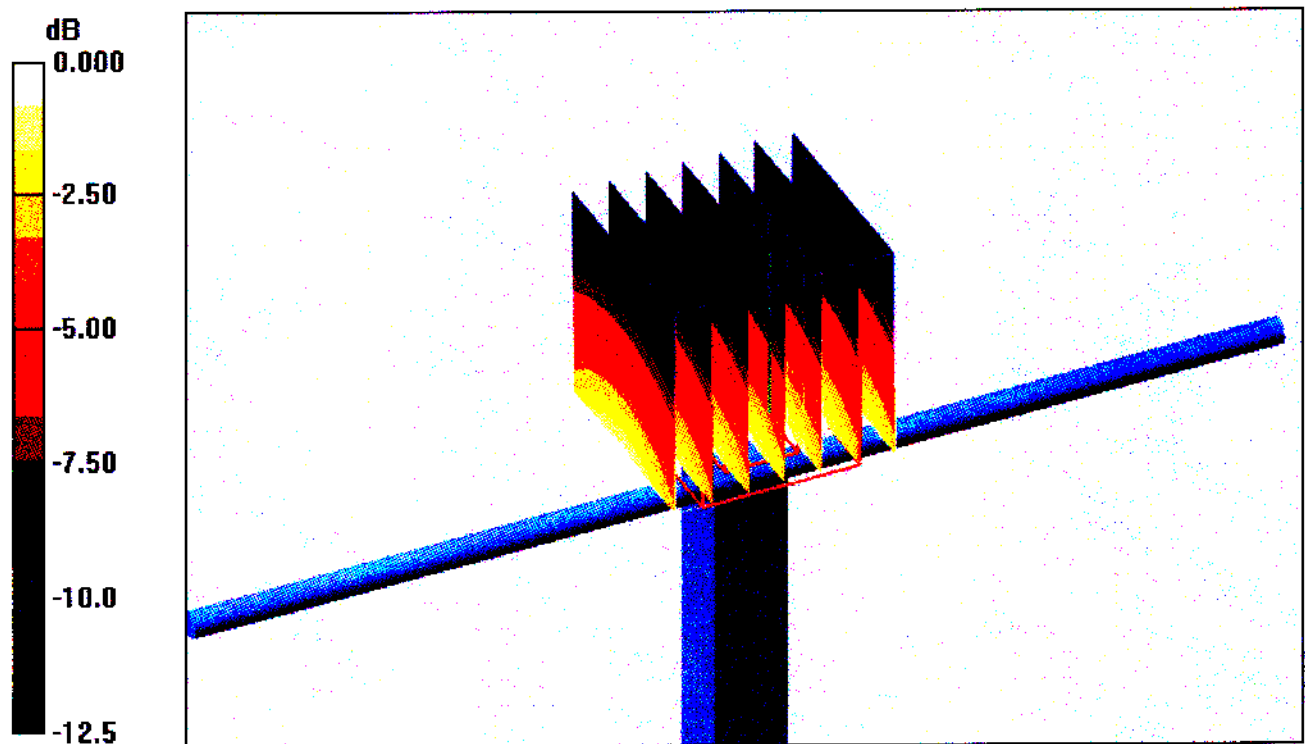
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 58.4 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 4.14 W/kg

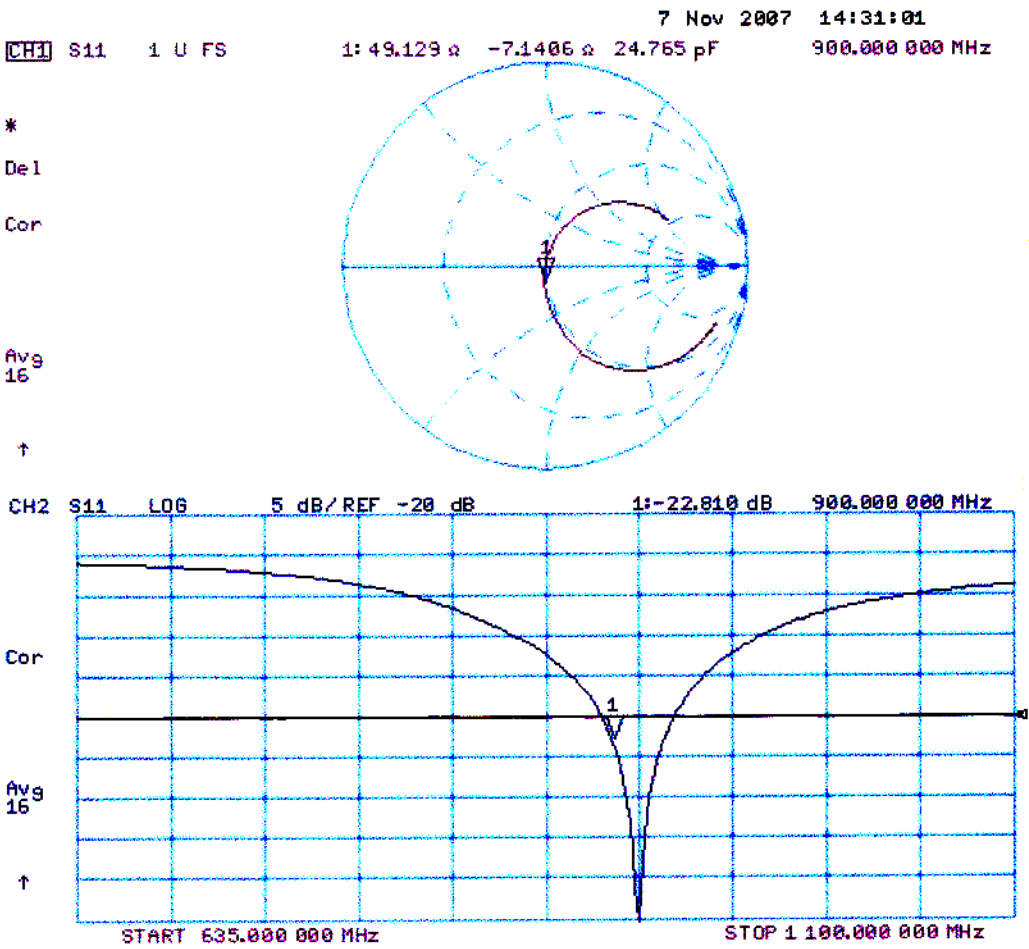
SAR(1 g) = 2.76 mW/g; SAR(10 g) = 1.77 mW/g

Maximum value of SAR (measured) = 3.01 mW/g



0 dB = 3.01mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 12.11.2007 14:43:14

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:153

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: MSL900;

Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 1.06 \text{ mho/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.57, 5.57, 5.57); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

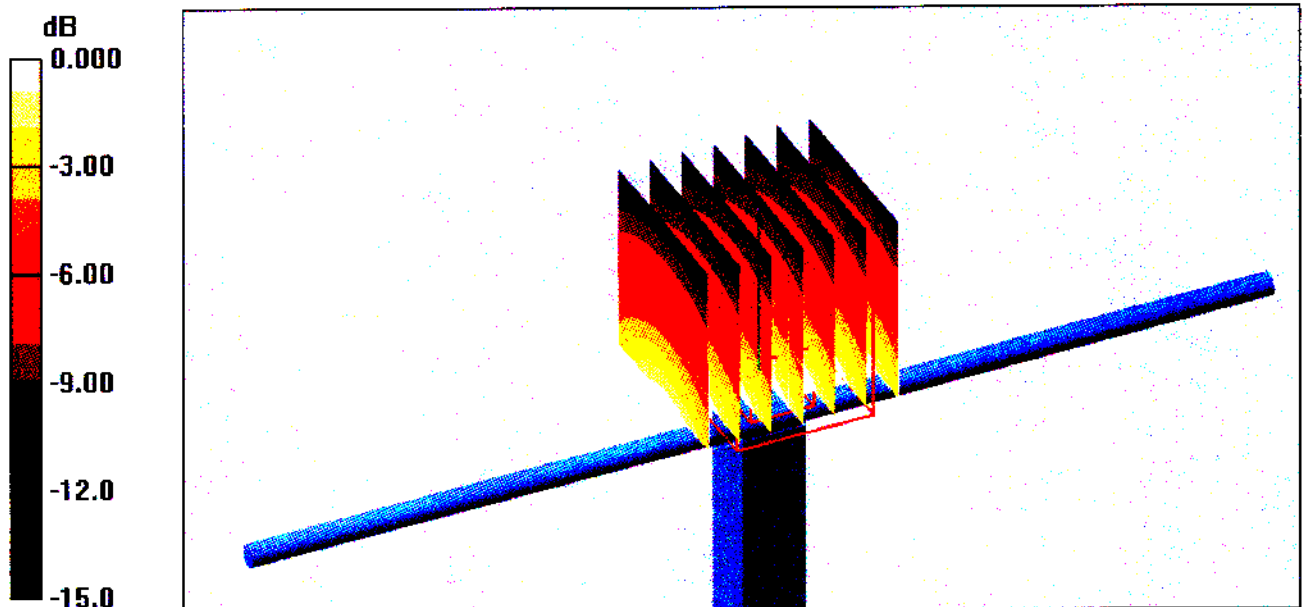
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.1 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 4.05 W/kg

SAR(1 g) = 2.81 mW/g; SAR(10 g) = 1.82 mW/g

Maximum value of SAR (measured) = 3.03 mW/g



0 dB = 3.03mW/g

Impedance Measurement Plot for Body TSL

