

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007

DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.41 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 53

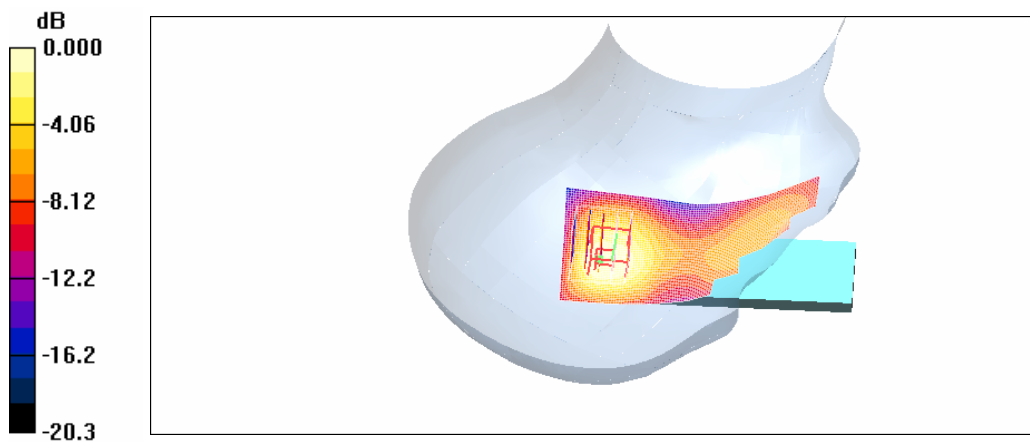
DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

Right tilt 661/Area Scan (51x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.118 mW/g

Right tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 4.02 V/m; Power Drift = -0.090 dB
Peak SAR (extrapolated) = 0.136 W/kg
SAR(1 g) = 0.088 mW/g; SAR(10 g) = 0.054 mW/g

Maximum value of SAR (measured) = 0.093 mW/g



0 dB = 0.093mW/g

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007

DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 835/900 MHz; Type: SAM

GSM850 body 190/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.236 mW/g

GSM850 body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

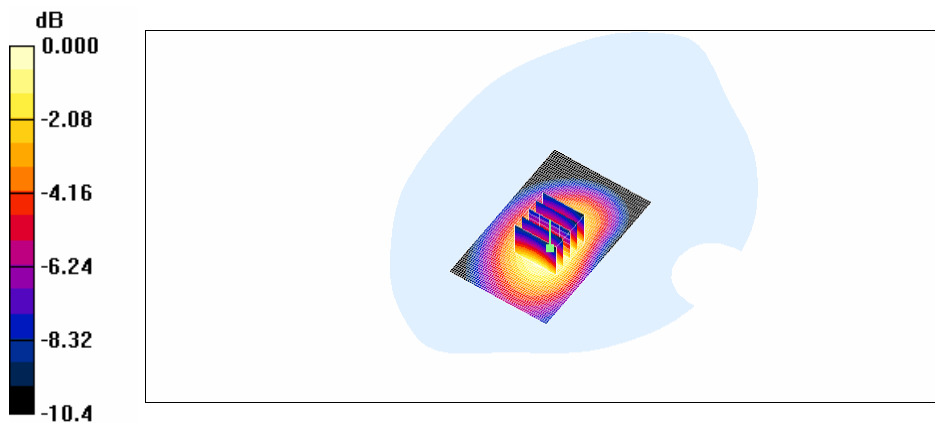
Reference Value = 9.50 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 0.289 W/kg

SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.150 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

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



0 dB = 0.229mW/g

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007
Option: Bluetooth

DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 835/900 MHz; Type: SAM

GSM850 body 190/Area Scan (51x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.233 mW/g

GSM850 body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

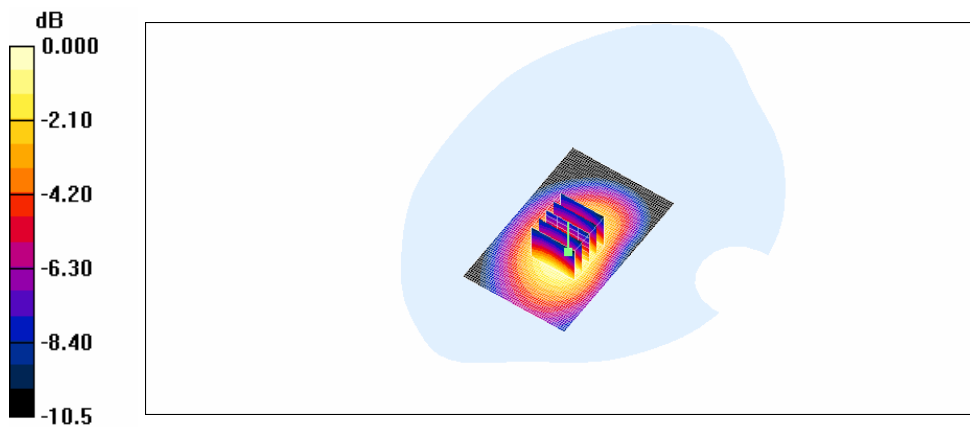
Reference Value = 9.60 V/m; Power Drift = 0.026 dB

Peak SAR (extrapolated) = 0.282 W/kg

SAR(1 g) = 0.213 mW/g; SAR(10 g) = 0.149 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

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



0 dB = 0.229mW/g

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007
Option GPRS

DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ;Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 835/900 MHz; Type: SAM

GSM850 body 190/Area Scan (51x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

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

GSM850 body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

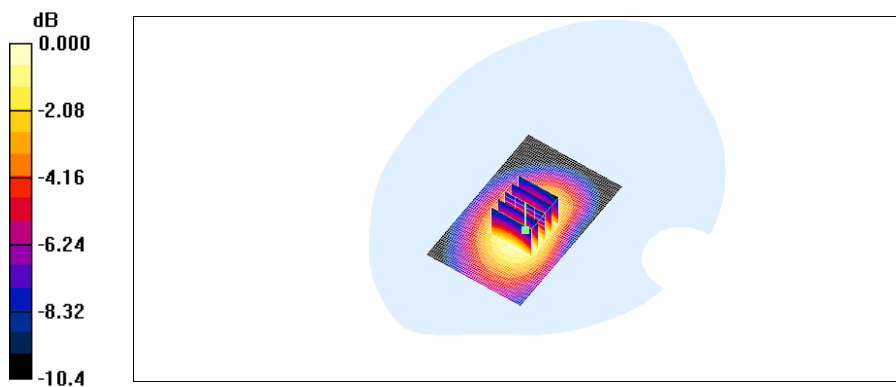
Reference Value = 9.67 V/m; Power Drift = -0.161 dB

Peak SAR (extrapolated) = 0.283 W/kg

SAR(1 g) = 0.212 mW/g; SAR(10 g) = 0.148 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.226 mW/g



0 dB = 0.226mW/g

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EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007
Option: Front

DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6 \text{ MHz}$; $\sigma = 0.99 \text{ mho/m}$; $\epsilon_r = 53.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 835/900 MHz; Type: SAM

GSM850 body 190/Area Scan (51x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.100 mW/g

GSM850 body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

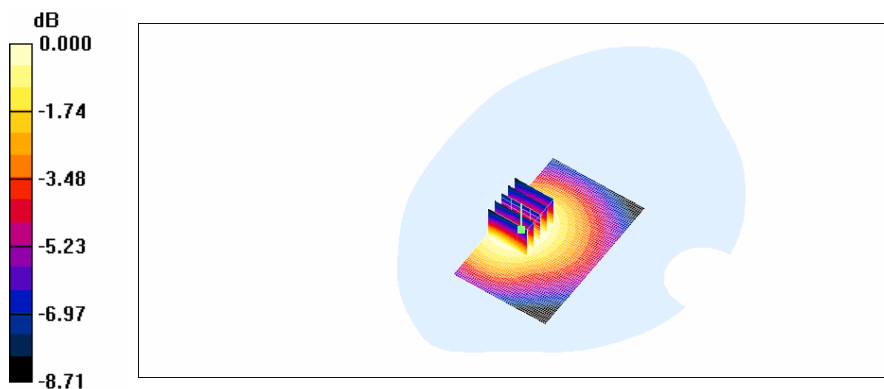
Reference Value = 7.19 V/m; Power Drift = -0.114 dB

Peak SAR (extrapolated) = 0.115 W/kg

SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.067 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.096 mW/g



0 dB = 0.096mW/g

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EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007

DUT: SL599; Type: FOLDER; Serial: #1

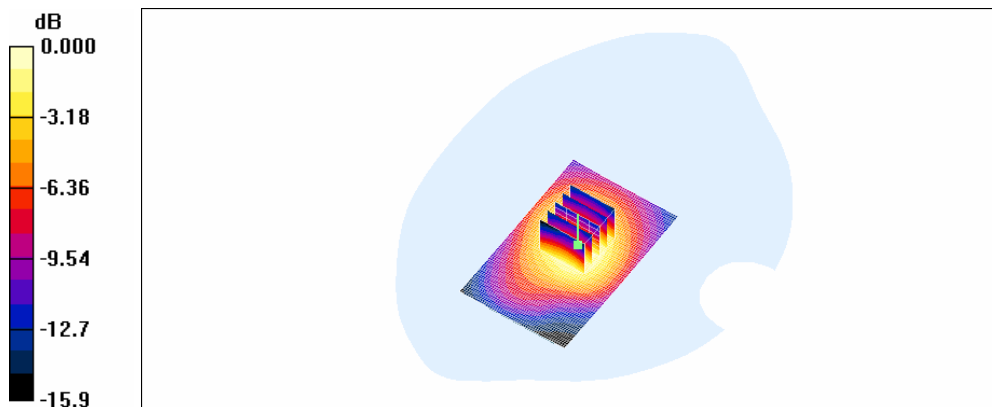
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.55 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ;Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

GSM1900 body 661/Area Scan (51x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.166 mW/g

GSM1900 body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 7.61 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 0.216 W/kg
SAR(1 g) = 0.151 mW/g; SAR(10 g) = 0.095 mW/g
Maximum value of SAR (measured) = 0.165 mW/g



0 dB = 0.165mW/g

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007
Option: Bluetooth

DUT: SL599; Type: FOLDER; Serial: #1

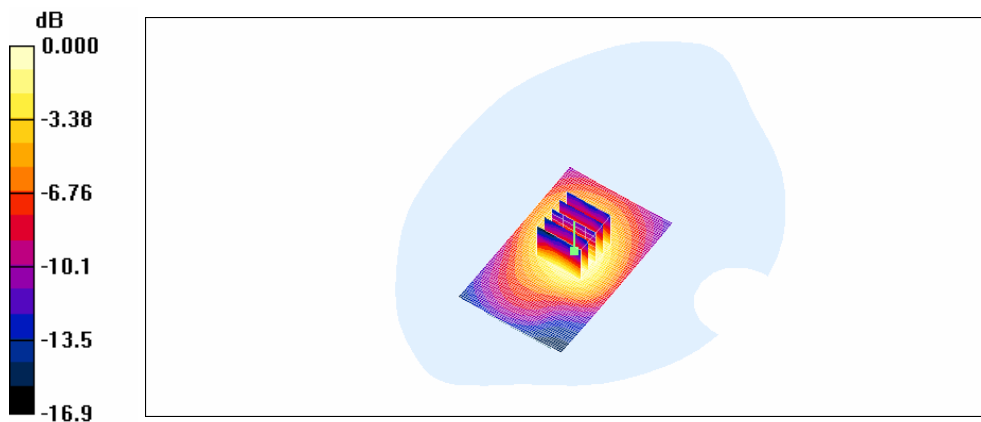
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.55 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ;Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

GSM1900 body 661/Area Scan (51x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.146 mW/g

GSM1900 body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 7.36 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 0.188 W/kg
SAR(1 g) = 0.131 mW/g; SAR(10 g) = 0.083 mW/g
Maximum value of SAR (measured) = 0.143 mW/g



0 dB = 0.143mW/g

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007
Option: GPRS

DUT: SL599; Type: FOLDER; Serial: #1

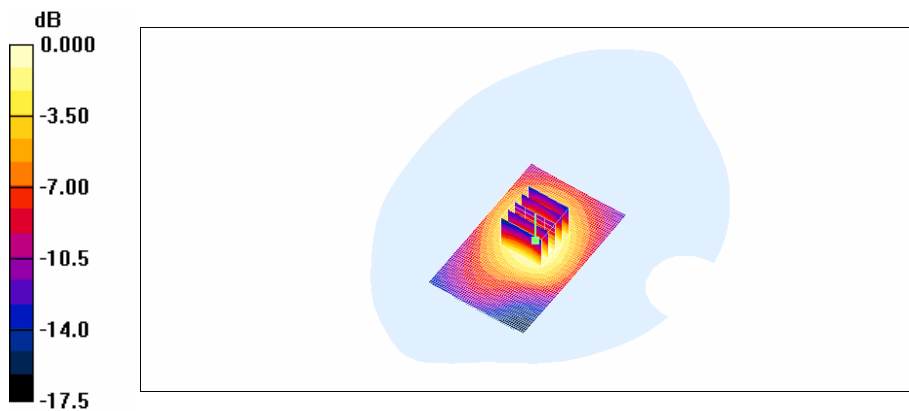
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.55 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ;Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

GSM1900 body 661/Area Scan (51x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.146 mW/g

GSM1900 body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 7.35 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 0.195 W/kg
SAR(1 g) = 0.132 mW/g; SAR(10 g) = 0.083 mW/g
Maximum value of SAR (measured) = 0.144 mW/g



0 dB = 0.144mW/g

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007
Option: Front

DUT: SL599; Type: FOLDER; Serial: #1

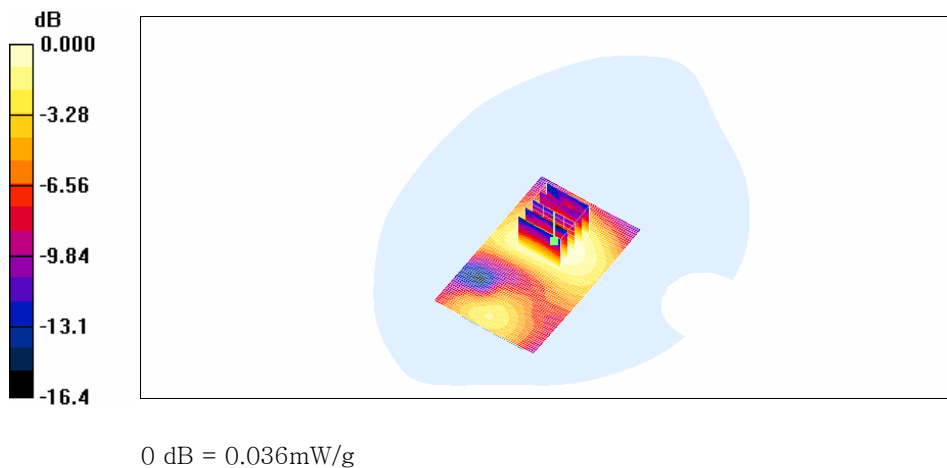
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.55 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ;Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

GSM1900 body 661/Area Scan (51x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.040 mW/g

GSM1900 body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 4.57 V/m; Power Drift = -0.109 dB
Peak SAR (extrapolated) = 0.052 W/kg
SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.022 mW/g
Maximum value of SAR (measured) = 0.036 mW/g



Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007

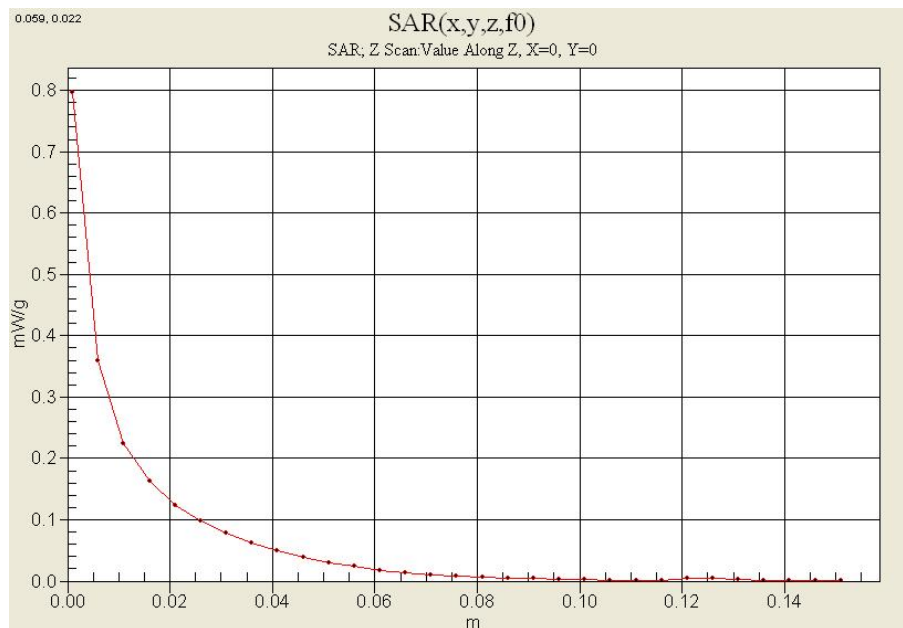
DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 850$ MHz; $\sigma = 0.894$ mho/m; $\epsilon_r = 41.5$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 835/900 MHz; Type: SAM

Left touch 251/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.797 mW/g



Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
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GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007

DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.99$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53

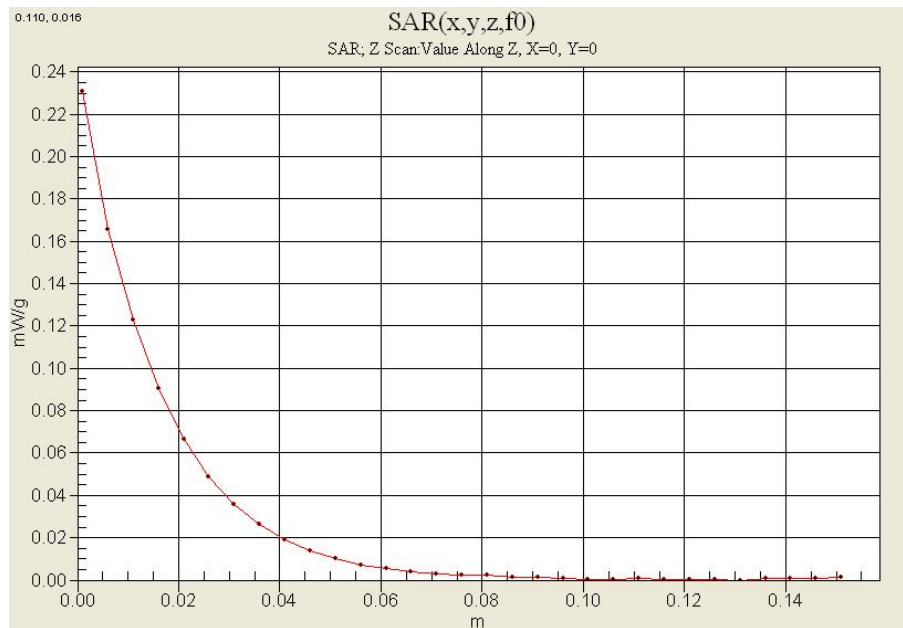
DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(6.58, 6.58, 6.58); Calibrated: 2007-02-21
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 835/900 MHz; Type: SAM

GSM850 body 190/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.231 mW/g



Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007

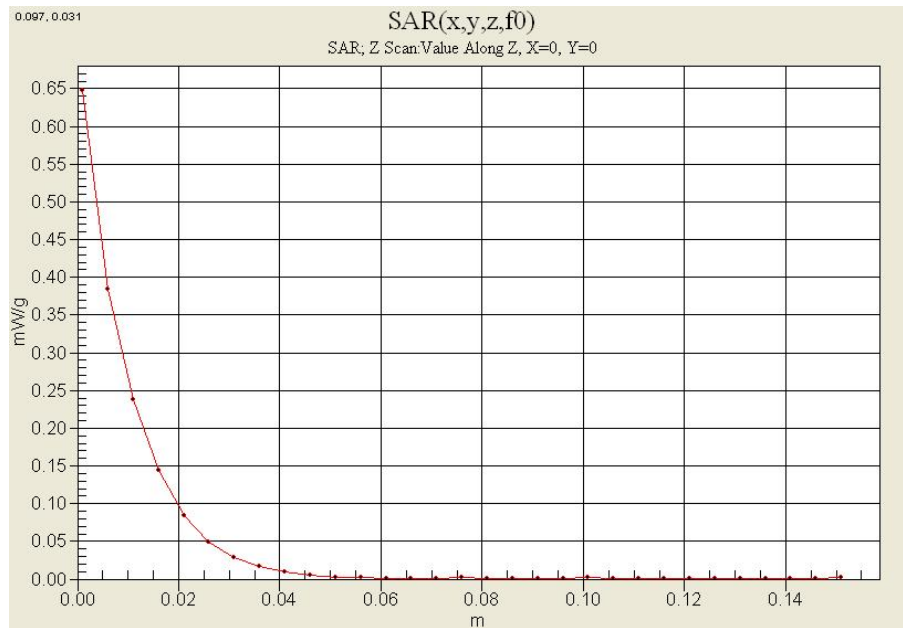
DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left touch 810/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.648 mW/g



Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD
EUT Type: Tri-band GSM Phone with Bluetooth (GSM850/DCS1800/PCS1900)
GPRS Class 8 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature: 21.9 °C
Ambient Temperature: 22.1 °C
Test Date: Apr.05, 2007

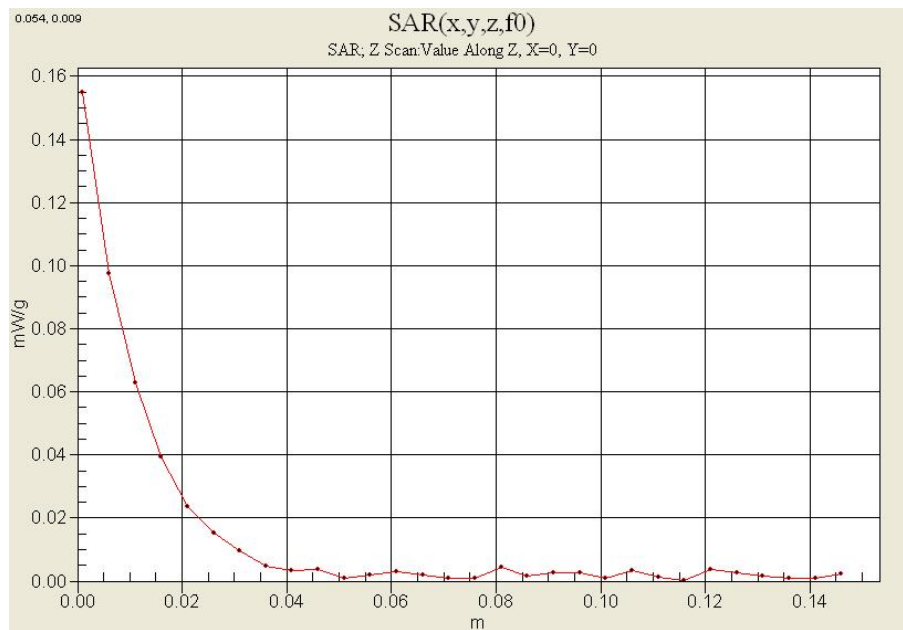
DUT: SL599; Type: FOLDER; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.55$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ;Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(4.61, 4.61, 4.61); Calibrated: 2007-02-21
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

GSM1900 body 661/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.155 mW/g



Attachment 2. – Dipole Validation Plots

■ Validation Data (835 MHz Head)

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD

Input Power 1W (30dBm)

Liquid Temp: 21.9 °C

Test Date: Apr.05, 2007

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:441

Program Name: Validation

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.88 \text{ mho/m}$; $\epsilon_r = 41.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(6.38, 6.38, 6.38); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 835/900 MHz; Type: SAM

Validation 835 MHz/Area Scan (61x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 10.5 mW/g

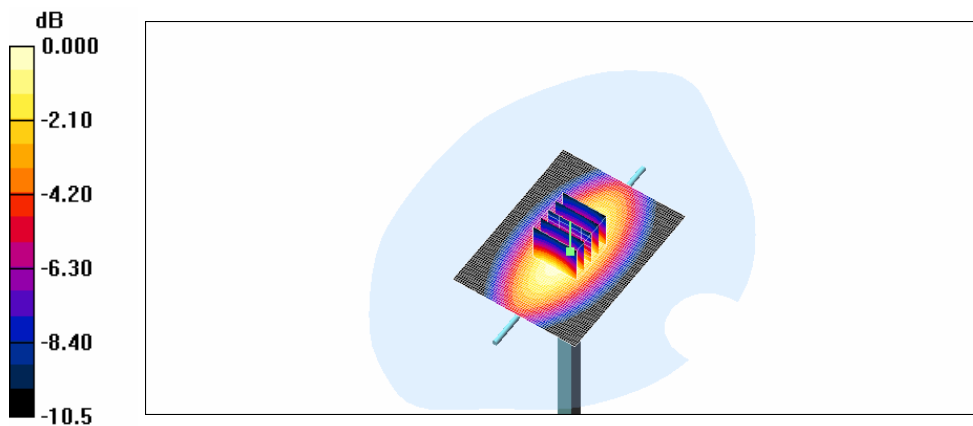
Validation 835 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 112.6 V/m; Power Drift = -0.024 dB

Peak SAR (extrapolated) = 13.9 W/kg

SAR(1 g) = 9.53 mW/g; SAR(10 g) = 6.28 mW/g

Maximum value of SAR (measured) = 10.3 mW/g



0 dB = 10.3mW/g

■ Validation Data (1900 MHz Head)

Test Laboratory: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD

Input Power 1W (30dBm)

Liquid Temp: 21.9 °C

Test Date: Apr.05, 2007

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d032

Program Name: Validation

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 53

DASY4 Configuration:

- Probe: ET3DV6 - SN1607; ConvF(5.27, 5.27, 5.27); Calibrated: 2007-02-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn447; Calibrated: 2007-03-06
- Phantom: SAM 1800/1900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 46.0 mW/g

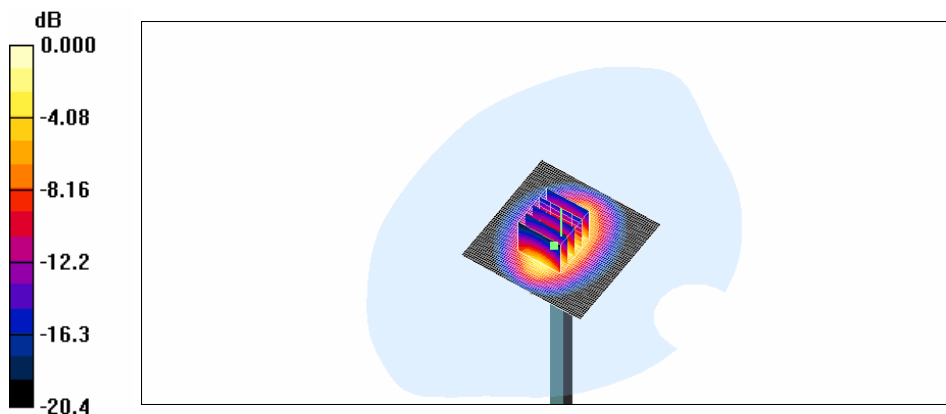
Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 185.3 V/m; Power Drift = -0.009 dB

Peak SAR (extrapolated) = 70.8 W/kg

SAR(1 g) = 39.5 mW/g; SAR(10 g) = 20.2 mW/g

Maximum value of SAR (measured) = 44.5 mW/g



0 dB = 44.5mW/g

■ Dielectric Parameter (835 MHz Head)

Title SL599
Sub Title GSM850(Head)
Test Date Apr.05, 2007

Frequency	e'	e''
800000000	42.0548	18.9964
805000000	41.9952	18.9848
810000000	41.8921	19.0070
815000000	41.8746	18.9843
820000000	41.8095	18.9803
825000000	41.7939	18.9786
830000000	41.6839	18.9769
835000000	41.6374	18.9525
840000000	41.5792	18.9213
845000000	41.5563	18.9014
850000000	41.5230	18.9156
855000000	41.4387	18.8927
860000000	41.4774	18.8658
865000000	41.3653	18.8823
870000000	41.2907	18.8476
875000000	41.2505	18.8236
880000000	41.2261	18.7651
885000000	41.1137	18.7981
890000000	41.0020	18.8111
895000000	40.9260	18.7889
900000000	40.8938	18.7444

■ Dielectric Parameter (835 MHz Body)

Title SL599
SubTitle GSM850(Body)
Test Date Apr.05, 2007

Frequency	e'	e''
800000000	53.5728	21.3591
805000000	53.5517	21.3430
810000000	53.5123	21.4009
815000000	53.4987	21.3369
820000000	53.4321	21.3425
825000000	53.3664	21.3311
830000000	53.3696	21.3230
835000000	53.3198	21.2732
840000000	53.3044	21.2553
845000000	53.2527	21.1960
850000000	53.2381	21.2650
855000000	53.2183	21.1404
860000000	53.1878	21.1609
865000000	53.1381	21.1560
870000000	53.0777	21.0912
875000000	53.1280	21.0918
880000000	53.1022	21.0729
885000000	53.0089	21.0270
890000000	53.0071	20.9837
895000000	52.9331	21.0102
900000000	52.8750	21.0202

■ Dielectric Parameter (1900 MHz Head)

Title SL599
SubTitle GSM1900(Head)
Test Date Apr.05, 2007

Frequency	e'	e''
1800000000	39.5822	13.3512
1810000000	39.5442	13.3769
1820000000	39.4832	13.4076
1830000000	39.4012	13.3820
1840000000	39.3685	13.4201
1850000000	39.3176	13.4364
1860000000	39.2397	13.4457
1870000000	39.2058	13.4758
1880000000	39.1707	13.5068
1890000000	39.1480	13.5271
1900000000	39.1395	13.5917
1910000000	39.0751	13.5940
1920000000	39.0388	13.6200
1930000000	39.0118	13.6313
1940000000	39.0022	13.6404
1950000000	38.9273	13.6652
1960000000	38.8582	13.6925
1970000000	38.8257	13.7022
1980000000	38.7377	13.7279
1990000000	38.7182	13.7674
2000000000	38.6841	13.7962

■ Dielectric Parameter (1900 MHz Body)

Title SL599
SubTitle GSM1900(Body)
Test Date Apr.05, 2007

Frequency	e'	e''
1800000000	52.3582	14.4985
1810000000	52.3135	14.5588
1820000000	52.2747	14.6107
1830000000	52.2049	14.6281
1840000000	52.2068	14.7178
1850000000	52.1966	14.7493
1860000000	52.1952	14.7515
1870000000	52.1225	14.7732
1880000000	52.0867	14.8060
1890000000	52.0504	14.8037
1900000000	51.9743	14.8195
1910000000	51.8991	14.8782
1920000000	51.8185	14.9245
1930000000	51.7576	14.9466
1940000000	51.7475	14.9912
1950000000	51.7520	15.0261
1960000000	51.7165	15.0622
1970000000	51.7183	15.1248
1980000000	51.7136	15.1398
1990000000	51.6734	15.1381
2000000000	51.6578	85.4627

Attachment 3. – Probe Calibration Data

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Client H-CT (Dymstec)

Certificate No: ET3-1607_Feb07

CALIBRATION CERTIFICATE

Object ET3DV6 - SN:1607

Calibration procedure(s) QA CAL-01.v5 and QA CAL-12.v4
Calibration procedure for dosimetric E-field probes

Calibration date: February 21, 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	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
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	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07
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

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

Issued: February 22, 2007

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Certificate No: ET3-1607_Feb07

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Accreditation No.: SCS 108

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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

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.

ET3DV6 SN:1607

February 21, 2007

Probe ET3DV6

SN:1607

Manufactured:	July 27, 2001
Last calibrated:	August 30, 2005
Modified:	February 19, 2007
Recalibrated:	February 21, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1607

February 21, 2007

DASY - Parameters of Probe: ET3DV6 SN:1607**Sensitivity in Free Space^A**

NormX	1.69 ± 10.1%	$\mu V/(V/m)^2$
NormY	1.72 ± 10.1%	$\mu V/(V/m)^2$
NormZ	1.81 ± 10.1%	$\mu V/(V/m)^2$

Diode Compression^B

DCP X	91 mV
DCP Y	93 mV
DCP Z	88 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	8.8	4.4
SAR _{be} [%] With Correction Algorithm	0.0	0.1

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	14.5	9.8
SAR _{be} [%] With Correction Algorithm	0.2	0.2

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%.

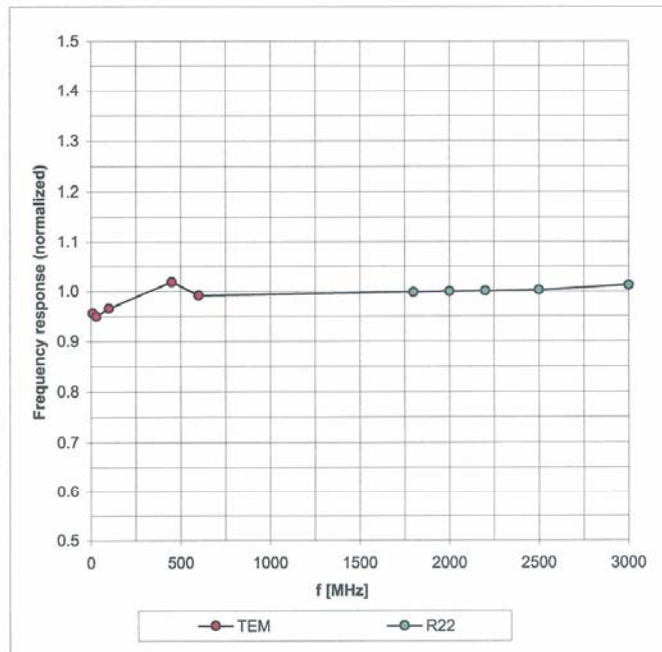
^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).^B Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1607

February 21, 2007

Frequency Response of E-Field

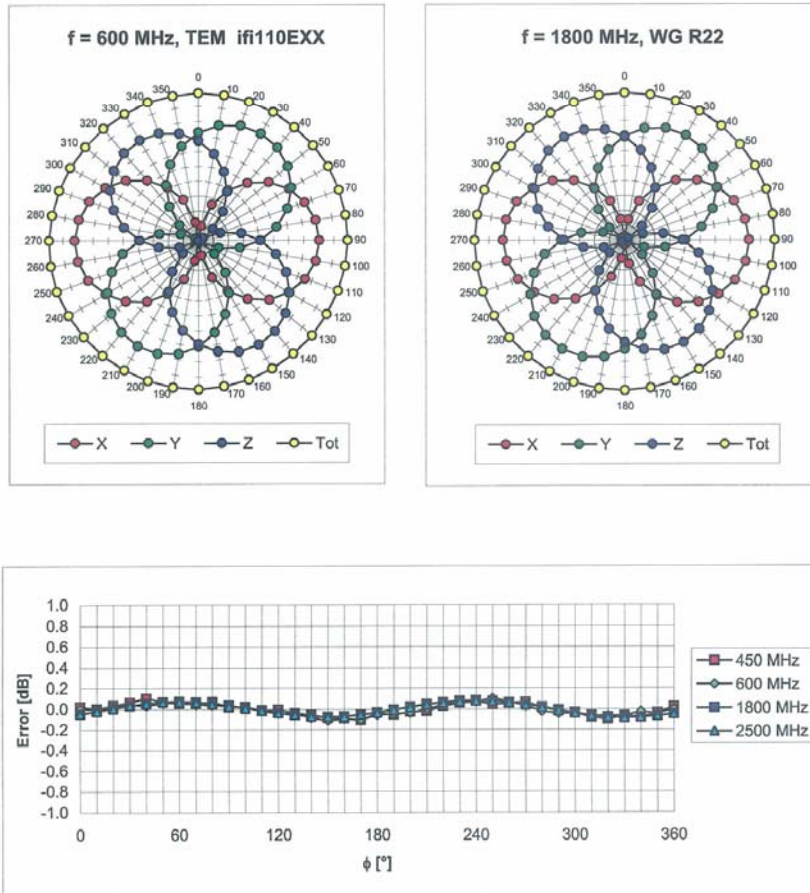
(TEM-Cell:ifi110 EXX, Waveguide: R22)

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

ET3DV6 SN:1607

February 21, 2007

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

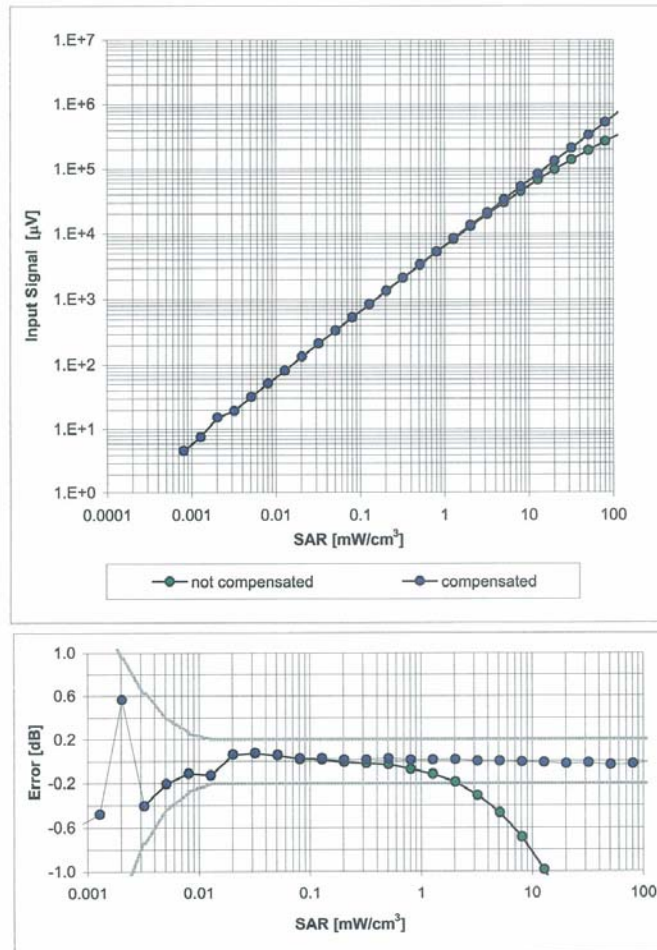


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ET3DV6 SN:1607

February 21, 2007

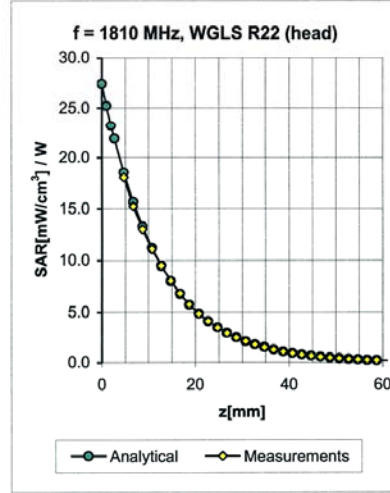
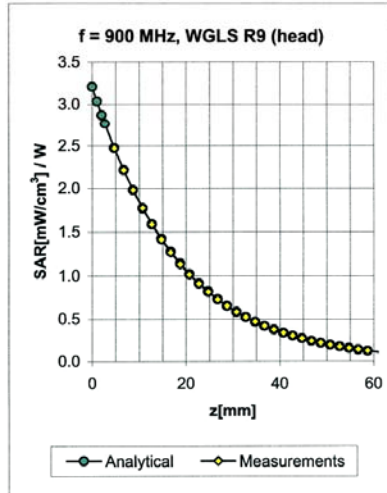
Dynamic Range $f(\text{SAR}_{\text{head}})$
(Waveguide R22, $f = 1800$ MHz)

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

ET3DV6 SN:1607

February 21, 2007

Conversion Factor Assessment



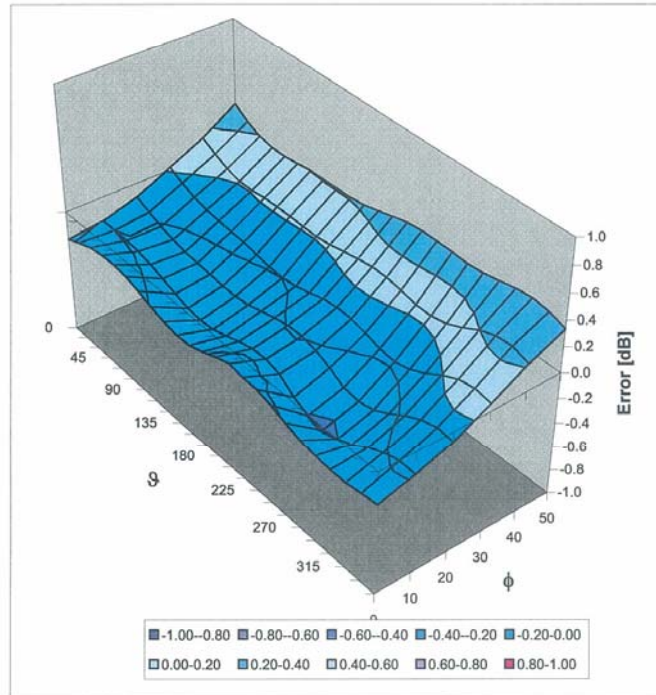
f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.37	1.87	7.02	± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.31	2.61	6.38	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.50	2.79	5.27	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.53	2.69	4.99	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.66	1.99	4.69	± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.32	1.97	7.62	± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.29	2.89	6.58	± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.70	2.39	4.61	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.57	2.44	4.13	± 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.

ET3DV6 SN:1607

February 21, 2007

Deviation from Isotropy in HSL

Error (ϕ , θ), $f = 900$ MHz

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

Attachment 4. – Dipole Calibration Data

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Accreditation No.: SCS 108

Client H-CT (Dymstec)

Certificate No: D835V2-441_Aug06

CALIBRATION CERTIFICATE

Object D835V2 - SN: 441

Calibration procedure(s) QA CAL-05.v6
Calibration procedure for dipole validation kits

Calibration date: August 14, 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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6	SN 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-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	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (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

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

Issued: August 17, 2006

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Certificate No: D835V2-441_Aug06

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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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- 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.

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1 Ω - 6.7 $j\Omega$
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.376 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	March 09, 2001

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1 Ω - 6.7 $j\Omega$
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.376 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	March 09, 2001

DASY4 Validation Report for Head TSL

Date/Time: 14.08.2006 13:00:04

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 441

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL900;

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.9 \text{ mho/m}$; $\epsilon_r = 42.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

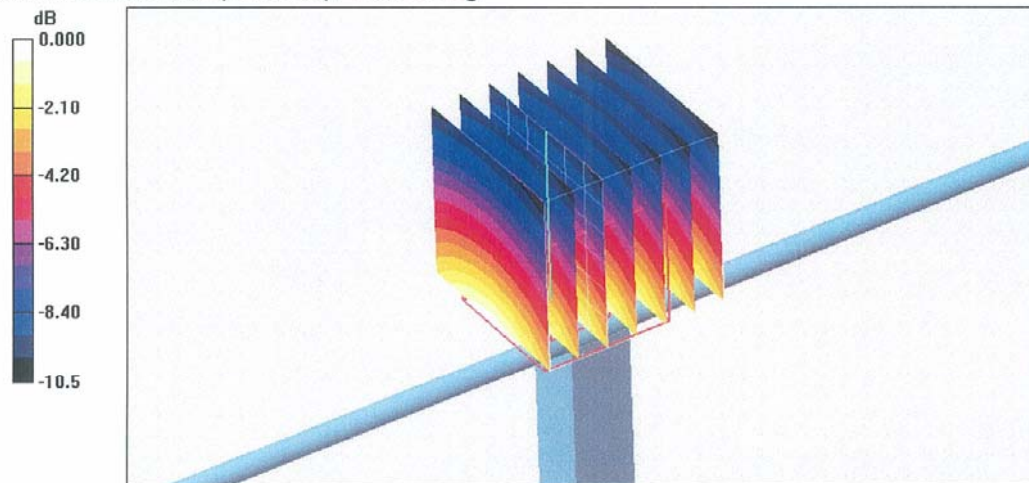
Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.4 V/m; Power Drift = -0.067 dB

Peak SAR (extrapolated) = 3.50 W/kg

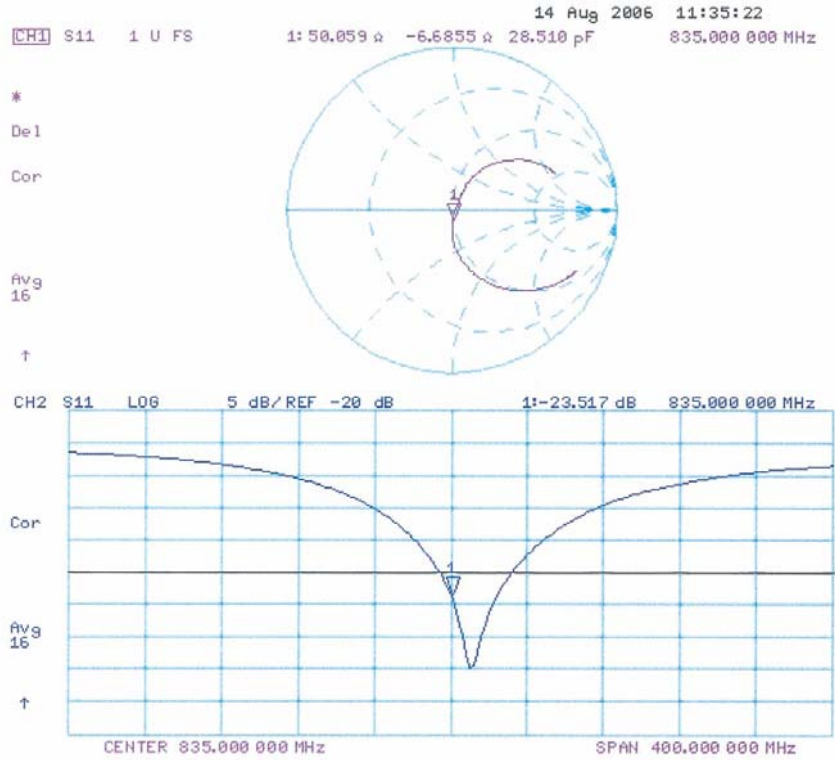
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.53 mW/g

Maximum value of SAR (measured) = 2.53 mW/g



0 dB = 2.53mW/g

Impedance Measurement Plot for Head TSL



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Accreditation No.: SCS 108

Client H-CT (Dymstec)

Certificate No: D1900V2-5d032_Feb07

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d032

Calibration procedure(s) QA CAL-05.v6
Calibration procedure for dipole validation kits

Calibration date: February 20, 2007

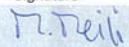
Condition of the calibrated item In Tolerance

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	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6	SN: 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
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-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

Calibrated by:	Name Mike Meili	Function Laboratory Technician	Signature 
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 21, 2007

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

Certificate No: D1900V2-5d032_Jan07

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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

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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- 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	1900 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 %	1.43 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.0 $\pm$ 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	9.55 mW / g
SAR normalized	normalized to 1W	38.2 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	37.2 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	5.03 mW / g
SAR normalized	normalized to 1W	20.1mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	19.8 mW / g $\pm$ 16.5 % (k=2)

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

Appendix**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	53.5 Ω + 3.3 j Ω
Return Loss	- 26.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 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	March 17, 2003

DASY4 Validation Report for Head TSL

Date/Time: 20.02.2007 14:35:32

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d032

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- 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 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

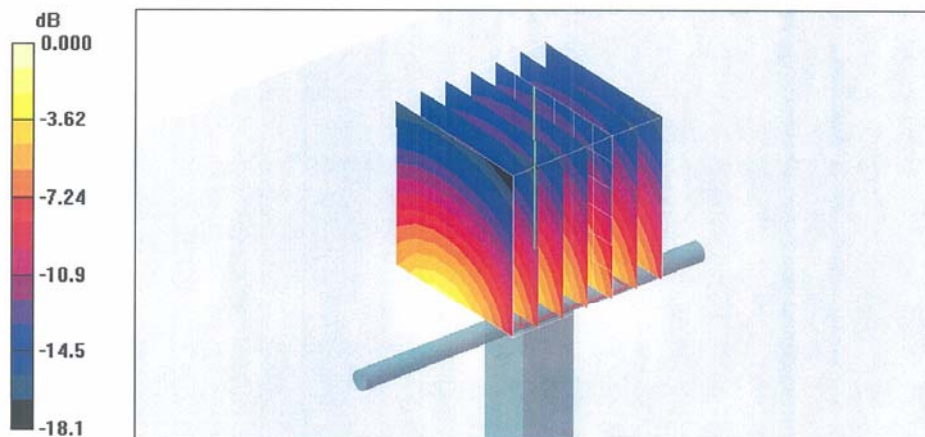
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.3 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 16.4 W/kg

SAR(1 g) = 9.55 mW/g; SAR(10 g) = 5.03 mW/g

Maximum value of SAR (measured) = 10.5 mW/g



0 dB = 10.5mW/g

Impedance Measurement Plot for Head TSL

