Schmid & Partner
Engineering AG

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Calibration Certificate

835 MHz System Validation Dipole

Type:	D835V2
Serial Number:	427
Place of Calibration:	Zurich
Date of Calibration:	Nov. 2, 2000
Calibration Interval:	24 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	Nikolova Neviana
Approved by:	Jelenić Katja

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with brain simulating sugar solution of the following electrical parameters at 835 MHz:

Relative Dielectricity	**40.8**	± 5%
Conductivity	**0.78 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.42 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue:	**9.16 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**5.96 mW/g**

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

3. Dipole Impedance and return loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.441 ns**	(one direction)
Transmission factor:	**0.988**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 835 MHz:	Re{Z} = **56.3 Ω**
	Im {Z} = **3.2 Ω**
Return Loss at 835 MHz	**-23.6 dB**

4. Handling

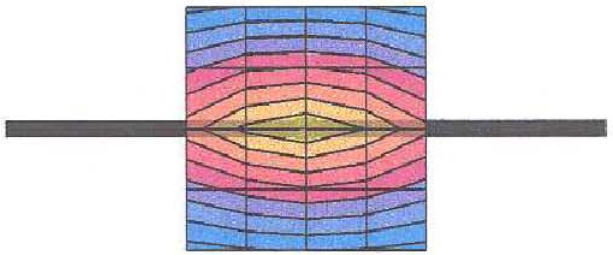
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

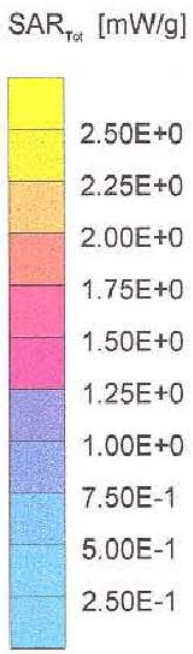
Do not apply excessive force to the dipole arms, because they might bend. If the dipole arms have to be bent back, take care to release stress to the soldered connections near the feedpoint; they might come off.

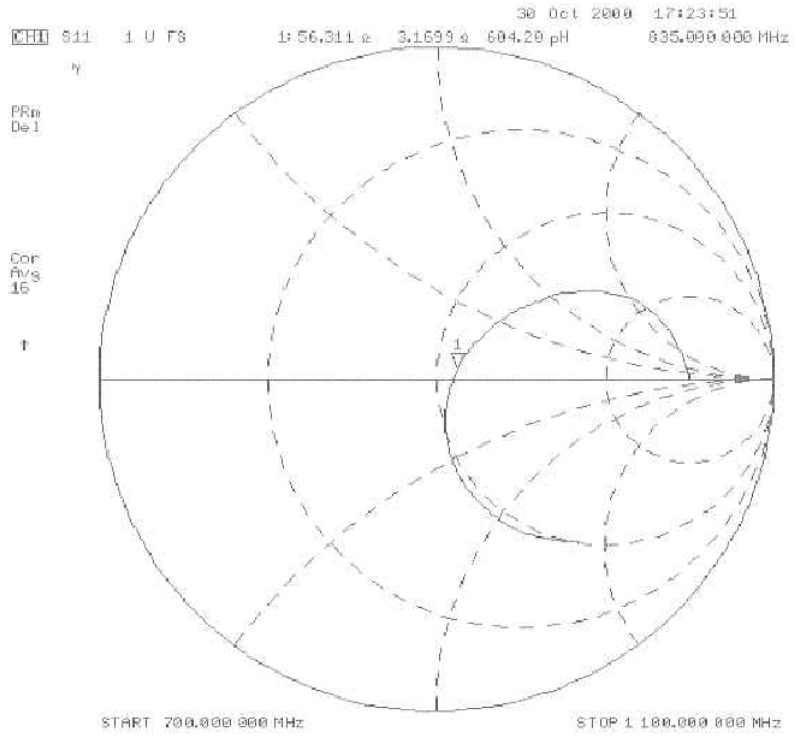
After prolonged use with 100 W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Validation Dipole D835V2 SN:427, d = 15 mm

Frequency: 835 MHz; Antenna Input Power: 250 [mW]
Generic Twin Phantom; Flat Section; Grid Spacing: Dx = 15.0, Dy = 15.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(6.42,6.42,6.42) at 900 MHz; Brain 835 MHz; σ = 0.78 mho/m ε_r = 40.8 ρ = 1.00 g/cm³
Cubes (2): Peak: 3.59 mW/g ± 0.04 dB, SAR (1g): 2.29 mW/g ± 0.02 dB, SAR (10g): 1.49 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 12.6 (11.1, 14.6) [mm]
Powerdrift: -0.00 dB



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PRm
Del
Cor
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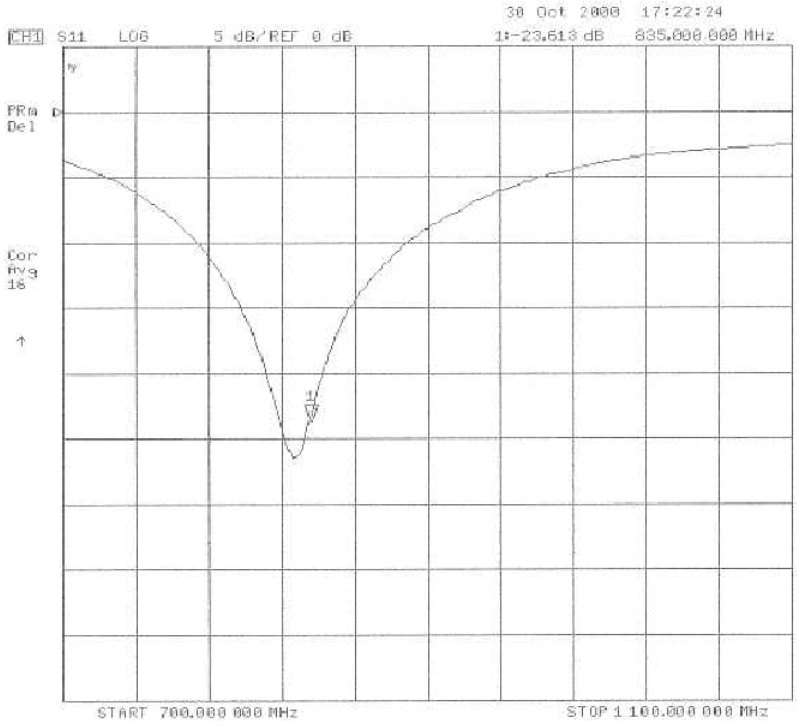
16
START 700.000 000 MHz
STOP 1 100.000 000 MHz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1:-23.613 dB 835.000 000 MHz
PRm
Del
Cor
Avg
16
START 700.000 000 MHz
STOP 1 100.000 000 MHz

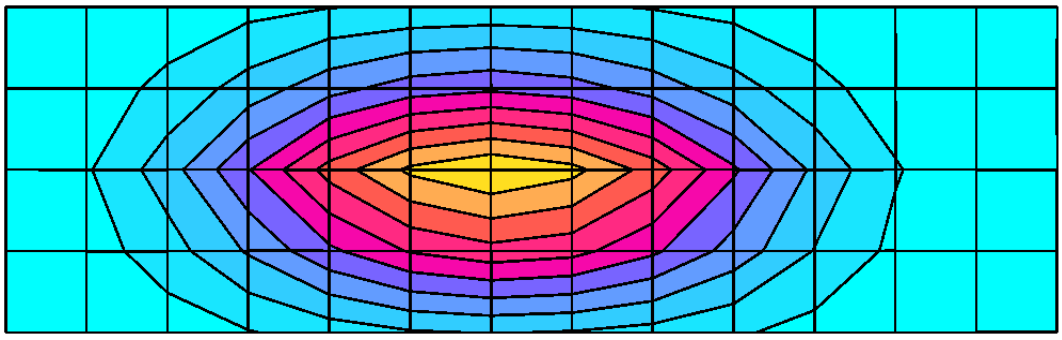
SPEAG Dipole 835 MHz; Test Date: 02/12/02

Run #: Sys Val_R1_020212-02
Model #: D835V2 SN: 427

TX Freq: 835 MHz Sim Tissue Temp: 20.5 (Celsius)
Start Power: 250mW
DAE: 3 DAE Version: 1
DAE SN: 363 DAE Cal Date: 08/22/01
- Comments-
New CGISS target for body at 1W is 10.82 (1g)
New CGISS target for body at 1W is 6.90 (10g)

SAR calculated is 10.82 mW/g, Percent from target (including drift) for 1g is 0 %
SAR calculated is 6.90 mW/g, Percent from target (including drift) for 1g is 0 %

Flat Phantom Phantom; Device Section; Position: (90°,0°);
Probe: ET3DV6 - SN1547; ConvF(6.20,6.20,6.20); Probe cal date: 11/16/01; Crest factor: 1.0; FCC Body_835 MHz: σ = 1.00 mho/m ε_r = 52.6 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 2.70 mW/g, SAR (10g): 1.72 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 90.0, 28.5, 4.0; Drift -0.01



SPEAG Dipole 835 MHz

Run #: Sys Val_R1_020212-02
Model #: D835V2 SN: 427

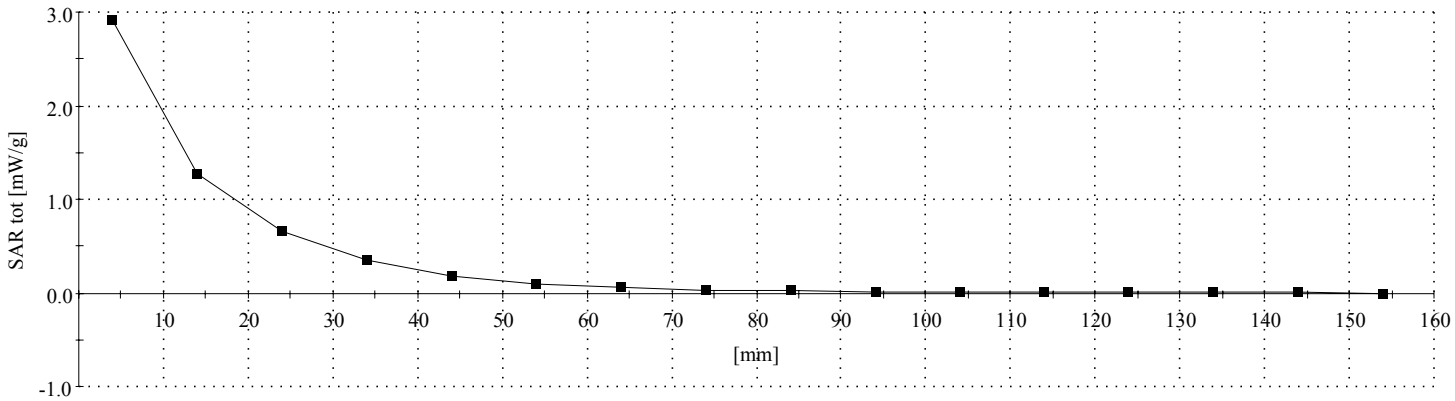
TX Freq: 835 MHz
Start Power: 250mW
DAE: 3
DAE SN: 363
Sim Tissue Temp: 20.5 (Celsius)
End Power:
DAE Version: 1
DAE Cal Date: 08/22/01

- Comments-
CGISS target at 1W is 10.82 (1g)
CGISS target at 1W is 6.90 (10g)

SAR calculated is 10.82 mW/g
SAR calculated is 6.90 mW/g

Flat Phantom Phantom; Section; Position: ; Frequency: 835 MHz
Probe: ET3DV6 - SN1547; ConvF(6.20,6.20,6.20); Crest factor: 1.0; FCC Body_835 MHz: σ = 1.00 mho/m ε_r = 52.6 ρ = 1.00 g/cm^3

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,

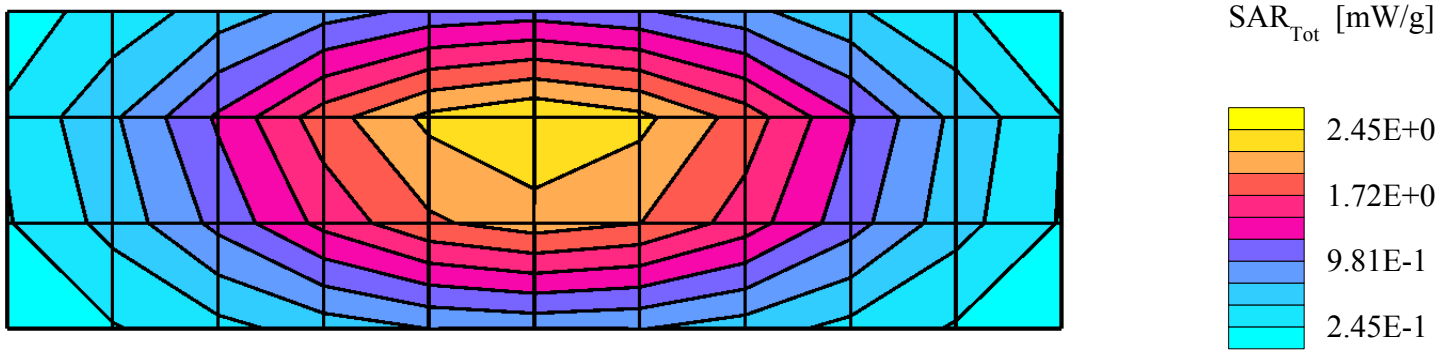


SPEAG Dipole 835 MHz; Test Date: 02/12/02

Run #: Sys Val_R1_020212-01
Model #: D835V2 SN: 427

TX Freq: 835 MHz Sim Tissue Temp: 21.0 (Celsius)
Start Power: 250mW
DAE: 3 DAE Version: 1
DAE SN: 363 DAE Cal Date: 08/22/01
- Comments-
IEEE std 1528 (Draft) target at 1W is 9.5 (1g)
IEEE std 1528 (Draft) target at 1W is 6.2 (10g)

SAR calculated is 9.74mW/g, Percent from target (including drift) for 1g is 2.5%
SAR calculated is 6.21mW/g, Percent from target (including drift) for 10g is 0.2%
Flat Phantom Phantom; Dipole Section; Position: (90°,0°);
Probe: ET3DV6 - SN1547; ConvF(6.40,6.40,6.40); Probe cal date: 11/16/01; Crest factor: 1.0; IEEE Head_835 MHz: σ = 0.89 mho/m ε_r = 40.2 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 2.43 mW/g, SAR (10g): 1.55 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 27.0, 75.0, 4.0; Drift -0.01



SPEAG Dipole 835 MHz

Run #: Sys Val_R1_020212-01
Model #: D835V2 SN: 427

TX Freq: 835 MHz Sim Tissue Temp: 21.0 (Celsius)
Start Power: 250mW End Power:
DAE: 3 DAE Version: 1
DAE SN: 363 DAE Cal Date: 08/22/01
- Comments-
IEEE std 1528 (Draft) target at 1W is 9.5 (1g)
IEEE std 1528 (Draft) target at 1W is 6.2 (10g)

SAR calculated is 9.74mW/g, Percent from target (including drift) for 1g is 2.5%
SAR calculated is 6.21mW/g, Percent from target (including drift) for 10g is 0.2%
Flat Phantom Phantom; Section; Position: ; Frequency: 835 MHz
Probe: ET3DV6 - SN1547; ConvF(6.40,6.40,6.40); Crest factor: 1.0; IEEE Head_835 MHz: σ = 0.89 mho/m ε_r = 40.2 ρ = 1.00 g/cm^3

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,

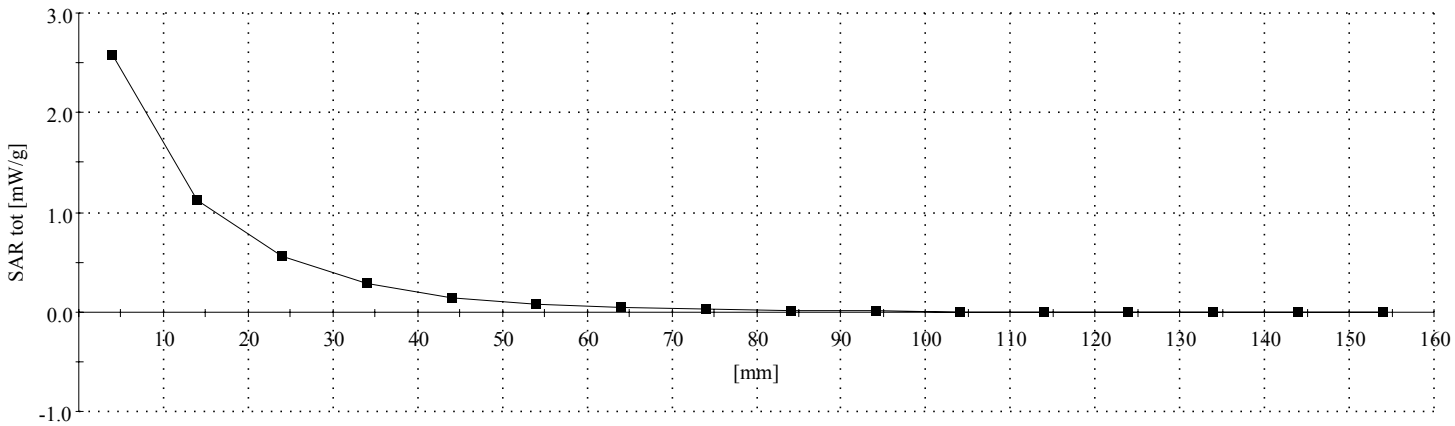


Figure 1. Highest S.A.R. configuration Run # Ab_R1_020228-07
S.A.R. performance assessment at abdomen with batteries

Figure 2. Highest S.A.R. configuration Run # Ab_R1_020304-06
S.A.R. performance assessment at abdomen with audio accessories

Figure 3. Highest S.A.R. configuration Run # Ab_R1_020308-05
S.A.R. performance assessment at abdomen (2.5cm)

Figure 4. Highest S.A.R. configuration Run # Face_R1_020311-09
S.A.R. performance assessment at face (2.5cm)