

The probe conversion factors in the 5-6 GHz frequency range were assessed in the setup based on the vertically standing waveguide type R58 (frequency band: 4.9 - 7.05 GHz). Due to the small waveguide dimensions, field disturbance by the probe could not be excluded and needs to be added to the uncertainty budget. Together with other error sources, the resulting probe calibration uncertainty for the EX3DV3 probe type was assessed to be $\pm 6.6\%$ ($k=1$) at Calibration Frequency and $\pm 13.6\%$ ($k=1$) for a narrow-band conversion factor (± 50 MHz).

26.3 Tissue Simulating Liquids

In the current guidelines and draft standards for compliance testing of mobile phones (e.g., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see Table 26.1).

SPEAG has developed suitable head (HSL5800) and body (MSL5800) tissue simulating liquids consisting of the following ingredients: deionized water, salt and a special composition including mineral oil and an emulgator. Dielectric parameters of these liquids were measured using a HP 85070B Dielectric Probe Kit in conjunction with HP 8753E Network Analyzer (30 kHz - 6 GHz). The differences with respect to the interpolated values were well within desired $\pm 5\%$ for the whole 5 to 5.8 GHz range.

f (GHz)	Head Tissue		Body Tissue		Reference
	ϵ	σ	ϵ	σ	
3.0	38.5	2.40	52.0	2.73	Standard
5.8	35.3	5.27	48.2	6.00	Standard
5.0	36.2	4.45	49.3	5.07	Interpolated
5.1	36.1	4.55	49.1	5.18	Interpolated
5.2	36.0	4.66	49.0	5.30	Interpolated
5.3	35.9	4.76	48.9	5.42	Interpolated
5.4	35.8	4.86	48.7	5.53	Interpolated
5.5	35.6	4.96	48.6	5.65	Interpolated
5.6	35.5	5.07	48.5	5.77	Interpolated
5.7	35.4	5.17	48.3	5.88	Interpolated

Table 26.1: Standard and interpolated dielectric parameters for head and body tissue simulating liquid in the frequency range 3 to 5.8 GHz.

Frequency (...)	Rel. Permitt...	Conductivity...	e''
5000	36.84	4.39	15.78
5100	36.59	4.49	15.83
5200	36.34	4.57	15.8
5300	36.15	4.68	15.87
5400	35.91	4.79	15.94
5500	35.74	4.96	16.21
5800	35.39	5.2	16.12

Density of simulated tissue: 1 g/cm³
 Density of actual medium: 1 g/cm³
 Thermal capacity: 1500 J/(kg K)
☒ Supports optical surface detection

Frequency (...)	Rel. Permitt...	Conductivity...	e''
5000	50.23	4.93	17.72
5100	49.99	5.06	17.83
5200	49.73	5.18	17.91
5300	49.5	5.32	18.04
5400	49.27	5.46	18.18
5500	49.1	5.59	18.27
5800	48.51	6.01	18.63

Density of simulated tissue: 1 g/cm³
 Density of actual medium: 1 g/cm³
 Thermal capacity: 1500 J/(kg K)
☒ Supports optical surface detection

26.4 SAR Evaluation

26.4.1 Area Scan job

Due to the reduced penetration depth in the corresponding liquid (6.0 mm at 6 GHz), the distance between the measured points and phantom surface during the **Area Scan** needs to be reduced as well as the tolerance, i.e., it should be less than 4.0 mm with a variation of less than ± 0.5 mm during the entire scan.

The recommend distance between the probe sensor and phantom surface is 1.5-2.0 mm.

26.4.2 Zoom Scan job

The strong decay would require that at least two measurement points are taken within the first 5 mm from the liquid-shell interface. The following setting for the **Zoom Scan** job are recommended for the best time vs. accuracy ratio:

- Grid Step size X and Y 4.3 mm
- Grid Step size Z 3.0 mm
- Grid Extent Z 21.0 mm
- Minimum distance of probe sensor to surface 1.5-2.0 mm