



## **Body Tissue Simulating Liquids**

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## Tissue Simulating Liquids

Verkotan offers tissue simulating liquids for various applications. The dielectric parameters of these liquids are tuned to match to real tissue parameters over a certain frequency range in a certain temperature. Based on Maxwell's equations the dielectric parameters capture the behaviour of electromagnetic field in a medium. Thus, they can be used to study how electromagnetic radiation propagates thru tissue.

The ingredients of the tissue simulants are selected among non-hazardous substances as far as applicable.

The dielectric parameters are measured with dielectric assessment kit, DAK-3.5 or DAK-12 Dielectric Probe manufactured by SPEAG. The dielectric measurement system is covering the 4 MHz – 20 GHz frequency range with an open-ended coaxial dielectric probe. With DAK, reference liquids are evaluated in accordance with IEC 62209, IEEE 1528, and several federal regulations.

Measurement report of the liquid will be included to the shipment.

### Application

Store the tissue simulant in closed container, stir the liquid thoroughly before the use and during the use if needed. Avoid making bubbles while mixing the liquid. Avoid evaporation of water while heating. Conductivity of the simulant can be adjusted by adding salt and relative permittivity by adding deionized water.



## Narrowband Body Tissue Simulating Liquids

### 150 MHz

150 MHz tissue simulant meets the target parameters of FCC KDB publication 865664 with a tolerance of  $\pm 5\%$ .

#### Ingredients

- Deionized water
- Tween
- Salt

Target data:Body		
f (MHz)	$\epsilon'$	$\sigma$ (S/m)
<b>150</b>	61.9	0.80

### 450 MHz

450 MHz tissue simulant meets the target parameters of FCC KDB publication 865664 with a tolerance of  $\pm 5\%$ .

#### Ingredients

- Deionized water
- Tween
- Salt

Target data:Body		
f (MHz)	$\epsilon'$	$\sigma$ (S/m)
<b>450</b>	56.7	0.94

## 700 – 935 MHz

700 – 935 MHz tissue simulant meets the target parameters of FCC KDB publication 865664 with a tolerance of  $\pm 5\%$ .

### Ingredients

- Deionized water
- Tween
- Salt

Target data:Body		
f (MHz)	$\epsilon'$	$\sigma$ (S/m)
<b>700</b>	55.7	0.96
<b>750</b>	55.5	0.96
<b>800</b>	55.3	0.97
<b>850</b>	55.2	0.99
<b>900</b>	55.0	1.05
<b>935</b>	55.0	1.07

## 1700 – 1 900 MHz

1 700 – 1 900 MHz tissue simulant meets the target parameters of FCC KDB publication 865664 with a tolerance of  $\pm 5\%$ .

### Ingredients

- Deionized water
- Tween
- Salt

Target data:Body		
f (MHz)	$\epsilon'$	$\sigma$ (S/m)
<b>1700</b>	53.6	1.46
<b>1750</b>	53.4	1.49
<b>1800</b>	53.3	1.52
<b>1850</b>	53.3	1.52
<b>1900</b>	53.3	1.52

## 2 000 – 2 700 MHz

2 000 – 2 700 MHz tissue simulant meets the target parameters of FCC KDB publication 865664 with a tolerance of  $\pm 5\%$ .

### Ingredients

- Deionized water
- Tween
- Salt

Target data:Body		
f (MHz)	$\epsilon'$	$\sigma$ (S/m)
<b>2000</b>	53.3	1.52
<b>2100</b>	53.2	1.62
<b>2200</b>	53.0	1.71
<b>2300</b>	52.9	1.81
<b>2400</b>	52.8	1.90
<b>2450</b>	52.7	1.95
<b>2500</b>	52.6	2.02
<b>2600</b>	52.5	2.16
<b>2700</b>	52.4	2.30

## Broadband Body Tissue Simulating Liquids

### 700 – 2 500 MHz

700 – 2 500 MHz tissue simulant meets the target parameters of FCC KDB publication 865664 with a tolerance of  $\pm 10\%$ .

#### Ingredients

- Deionized water
- Tween
- Salt

Target data:Body		
f (MHz)	$\epsilon'$	$\sigma$ (S/m)
<b>700</b>	55.7	0.96
<b>800</b>	55.3	0.97
<b>900</b>	55.0	1.05
<b>1000</b>	54.8	1.10
<b>1100</b>	54.7	1.14
<b>1200</b>	54.5	1.19
<b>1300</b>	54.3	1.23
<b>1400</b>	54.1	1.28
<b>1500</b>	53.9	1.33
<b>1600</b>	53.8	1.39
<b>1700</b>	53.6	1.46
<b>1800</b>	53.3	1.52
<b>1900</b>	53.3	1.52
<b>2000</b>	53.3	1.52
<b>2100</b>	53.2	1.62
<b>2200</b>	53.0	1.71
<b>2300</b>	52.9	1.81
<b>2400</b>	52.8	1.90
<b>2500</b>	52.6	2.02

## 2 500 – 6 000 MHz

2 500 – 6 000 MHz tissue simulant meets the target parameters of FCC KDB publication 865664 with a tolerance of  $\pm 10\%$ .

### Ingredients

- Deionized water
- Tween
- Salt

Target data:Body		
f (MHz)	$\epsilon'$	$\sigma$ (S/m)
<b>2500</b>	52.6	2.02
<b>2600</b>	52.5	2.16
<b>2700</b>	52.4	2.30
<b>2800</b>	52.3	2.45
<b>2900</b>	52.1	2.59
<b>3000</b>	52.0	2.73
<b>3500</b>	51.3	3.31
<b>4000</b>	50.6	3.90
<b>4500</b>	50.0	4.48
<b>5000</b>	49.3	5.07
<b>5500</b>	48.6	5.65
<b>6000</b>	47.9	6.23