Appendix 5

pages 1 - 3

BRAIN TISSUE SIMULATING LIQUIDS

Schmid & Partner
Engineering AG

Oberer Deutweg 59, CH-8400 Winterthur, Telefon +41 52 232 7272, Fax +41 52 232 7127

Brain Tissue Simulating Liquids

Preparation of the Liquids

Requirements:

- Scale
- Magneto Stirrer: Heating Plate, Magnetos (recommended).
- HP 85070A Dielectric Probe Kit (200MHz to 20GHz) plus mounting device and Network Analyser
- Canisters or "closed" jars to store the liquid (recommended)

Preparation:

1.) Heat the water to about 40° Celsius.

2.) Add salt and bactericide to water while stirring and wait until salt is disolved.

3.) Add about one third of the sugar. Keep stirring. Wait until sugar is disolved. Add the second third and when disolved add the final third. The liquid gains volume and thickens slightly.

4.) Keep stirring at maximum speed possible.

5.) When all the sugar is disolved, add the HEC. HEC is highly hygroscopic. It forms lumps when added to the liquid. Either "help" the magneto stirrer by stirring from outside or disolve all of the HEC first in another jar with a little bit of liquid using another stirrer. Add it then to the rest of the solution. Once HEC is added the liquid thickens considerably.

6.) During the whole process watch the temperature to prevent water evaporation.

7.) Once the liquid clears up pour it into canisters. Let it stand for a couple of hours before using it.

III Use

- When in the item (phantom models), monitor water evaporation.
- To minimze water evaporation cover the phantoms when not used. Do not store the liquid in the phantoms, rather store it in closed canisters.
- In case water has evaporated, you can add (warm) water to the liquid. Be sure that after stirring it is completely homogeneous.
- The liquid can be used for at least 3 months. After longer periods bacteria might grow that are resistant against the bactericide.

Recipe 900 MHz:

Water	40.1 %
Sugar	58.0 %
Salt (NaCl)	0.8 %
HEC (Hydroxyethylcellulosis)	1.0 %
Preservative Substance	

900 MHz: $\varepsilon_r = 42.5 \pm 5\%$ and $\sigma = 0.85 \pm 10\%$ mho/m

Recipe 1800 MHz:

Water	45.0 %
Sugar	53.9 %
HEC (Hydroxyethylcellulosis)	1.0 %
Preservative Substance	

1800 MHz: $\varepsilon_r = 41.0 \pm 5\%$ and $\sigma = 1.65 \pm 10\%$ mho/m

Parameters of Probe ET3DV4 SN:1105

NormX	1.53	$\mu V/(V/m)^2$
NormY	1.6	$\mu V/(V/m)^2$
NormZ	1.42	$\mu V/(V/m)^2$
DCP	43000	μV
ConvF(450MHz)	6.64 ± 10%	ε_r=47.2 ± 5%; σ=0.45 ± 10% mho/m[1]
ConvF(900MHz)	5.98 ± 10%	ε_r=42.5 ± 5%; σ=0.86 ± 10% mho/m[1]
ConvF(1800MHz)	4.85 ± 10%	ε_r=41.0 ± 5%; σ=1.7 ± 10% mho/m[1]
$d_{probe\_tip - center\_dipoles}$	2.7	mm
$d_{surface - probe\_tip}$	1.2 ± 0.2	mm

[1] Brain tissue simulating liquids