

## APPENDIX B: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

- 1) The network analyzer and probe system were configured and calibrated.
- 2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
- 3) The complex admittance with respect to the probe aperture was measured
- 4) The complex relative permittivity  $\epsilon'$  can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\epsilon_r\epsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp[-j\omega r(\mu_0\epsilon_r'\epsilon_0)^{1/2}]}{r} d\phi' d\rho' d\rho$$

where  $Y$  is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively,  $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$ ,  $\omega$  is the angular frequency, and  $j = \sqrt{-1}$ .

### 3 Composition / Information on ingredients

#### 3.2 Mixtures

**Description:** Aqueous solution with surfactants and inhibitors

**Declarable, or hazardous components:**

|                                                                        |                                                                                                                        |           |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------|
| CAS: 107-21-1<br>EINECS: 203-473-3<br>Reg.nr.: 01-2119456816-28-0000   | <b>Ethanedial</b><br>STOT RE 2, H373;<br>Acute Tox. 4, H302                                                            | >1.0-4.9% |
| CAS: 68608-26-4<br>EINECS: 271-781-5<br>Reg.nr.: 01-2119527859-22-0000 | <b>Sodium petroleum sulfonate</b><br>Eye Irrit. 2, H319                                                                | < 2.9%    |
| CAS: 107-41-5<br>EINECS: 203-489-0<br>Reg.nr.: 01-2119539582-35-0000   | <b>Hexylene Glycol / 2-Methyl-pentane-2,4-diol</b><br>Skin Irrit. 2, H315; Eye Irrit. 2, H319                          | < 2.9%    |
| CAS: 68920-66-1<br>NLP: 500-236-9<br>Reg.nr.: 01-2119489407-26-0000    | <b>Alkoxylated alcohol, &gt; C<sub>16</sub></b><br>Aquatic Chronic 2, H411;<br>Skin Irrit. 2, H315; Eye Irrit. 2, H319 | < 2.0%    |

**Additional information:**

For the wording of the listed risk phrases refer to section 16.

Not mentioned CAS-, EINECS- or registration numbers are to be regarded as Proprietary/Confidential.

The specific chemical identity and/or exact percentage concentration of proprietary components is withheld as a trade secret.

**Figure B-1**

Note: Liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

|                           |                                      |                                   |
|---------------------------|--------------------------------------|-----------------------------------|
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## Measurement Certificate / Material Test

|              |                                                 |
|--------------|-------------------------------------------------|
| Item Name    | Head Tissue Simulating Liquid (HBBL600-10000V6) |
| Product No.  | SL AAH U16 BC (Batch: 181031-2)                 |
| Manufacturer | SPEAG                                           |

## Measurement Method

TSL dielectric parameters measured using calibrated DAK probe.

## Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

## Test Condition

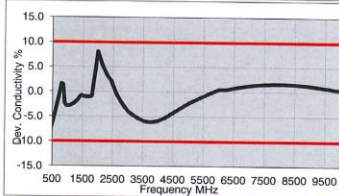
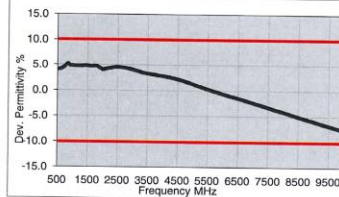
|                   |                     |
|-------------------|---------------------|
| Ambient Condition | 22°C ; 30% humidity |
| TSL Temperature   | 22°C                |
| Test Date         | 31-Oct-18           |
| Operator          | CL                  |

## Additional Information

|                   |
|-------------------|
| TSL Density       |
| TSL Heat-capacity |

## Results

| f [MHz] | Measured    |              |       | Target |       | Diff.to Target [%] |                |
|---------|-------------|--------------|-------|--------|-------|--------------------|----------------|
|         | $\epsilon'$ | $\epsilon''$ | sigma | eps    | sigma | $\Delta\epsilon$   | $\Delta\sigma$ |
| 800     | 43.8        | 20.5         | 0.91  | 41.7   | 0.90  | 5.1                | 1.4            |
| 825     | 43.8        | 20.1         | 0.92  | 41.6   | 0.91  | 5.3                | 1.5            |
| 835     | 43.8        | 19.9         | 0.93  | 41.5   | 0.91  | 5.4                | 2.0            |
| 850     | 43.7        | 19.7         | 0.93  | 41.5   | 0.92  | 5.3                | 1.5            |
| 900     | 43.5        | 18.9         | 0.95  | 41.5   | 0.97  | 4.8                | -2.1           |
| 1400    | 42.5        | 15.0         | 1.17  | 40.6   | 1.18  | 4.7                | -0.8           |
| 1450    | 42.5        | 14.8         | 1.19  | 40.5   | 1.20  | 4.9                | -0.8           |
| 1600    | 42.2        | 14.3         | 1.27  | 40.3   | 1.28  | 4.7                | -1.1           |
| 1625    | 42.2        | 14.2         | 1.29  | 40.3   | 1.30  | 4.8                | -0.7           |
| 1640    | 42.2        | 14.2         | 1.30  | 40.3   | 1.31  | 4.8                | -0.5           |
| 1650    | 42.1        | 14.2         | 1.30  | 40.2   | 1.31  | 4.6                | -1.0           |
| 1700    | 42.1        | 14.0         | 1.33  | 40.2   | 1.34  | 4.8                | -0.9           |
| 1750    | 42.0        | 13.9         | 1.36  | 40.1   | 1.37  | 4.8                | -0.8           |
| 1800    | 41.9        | 13.9         | 1.39  | 40.0   | 1.40  | 4.7                | -0.7           |
| 1810    | 41.9        | 13.8         | 1.40  | 40.0   | 1.40  | 4.7                | 0.0            |
| 1825    | 41.9        | 13.8         | 1.41  | 40.0   | 1.40  | 4.7                | 0.7            |
| 1850    | 41.8        | 13.8         | 1.42  | 40.0   | 1.40  | 4.5                | 1.4            |
| 1900    | 41.8        | 13.7         | 1.45  | 40.0   | 1.40  | 4.5                | 3.6            |
| 1950    | 41.7        | 13.7         | 1.48  | 40.0   | 1.40  | 4.3                | 5.7            |
| 2000    | 41.6        | 13.6         | 1.51  | 40.0   | 1.40  | 4.0                | 7.9            |
| 2050    | 41.6        | 13.6         | 1.55  | 39.9   | 1.44  | 4.2                | 7.3            |
| 2100    | 41.5        | 13.5         | 1.58  | 39.8   | 1.49  | 4.2                | 6.1            |
| 2150    | 41.4        | 13.5         | 1.62  | 39.7   | 1.53  | 4.2                | 5.7            |
| 2200    | 41.4        | 13.5         | 1.65  | 39.6   | 1.58  | 4.4                | 4.6            |
| 2250    | 41.3        | 13.5         | 1.69  | 39.6   | 1.62  | 4.4                | 4.2            |
| 2300    | 41.2        | 13.5         | 1.72  | 39.5   | 1.67  | 4.4                | 3.2            |
| 2350    | 41.1        | 13.5         | 1.76  | 39.4   | 1.71  | 4.4                | 2.9            |
| 2400    | 41.1        | 13.5         | 1.80  | 39.3   | 1.76  | 4.6                | 2.5            |
| 2450    | 41.0        | 13.5         | 1.84  | 39.2   | 1.80  | 4.6                | 2.2            |
| 2500    | 40.9        | 13.5         | 1.88  | 39.1   | 1.85  | 4.5                | 1.4            |
| 2550    | 40.8        | 13.5         | 1.92  | 39.1   | 1.91  | 4.4                | 0.6            |
| 2600    | 40.8        | 13.6         | 1.96  | 39.0   | 1.96  | 4.6                | -0.2           |
| 3500    | 39.2        | 14.1         | 2.74  | 37.9   | 2.91  | 3.3                | -5.8           |
| 3700    | 38.9        | 14.2         | 2.93  | 37.7   | 3.12  | 3.1                | -6.1           |



|       |      |      |       |      |       |      |      |
|-------|------|------|-------|------|-------|------|------|
| 5200  | 36.3 | 15.8 | 4.57  | 36.0 | 4.66  | 0.9  | -1.7 |
| 5250  | 36.2 | 15.9 | 4.63  | 35.9 | 4.71  | 0.8  | -1.6 |
| 5300  | 36.1 | 15.9 | 4.69  | 35.9 | 4.76  | 0.7  | -1.4 |
| 5500  | 35.8 | 16.1 | 4.92  | 35.6 | 4.96  | 0.3  | -0.9 |
| 5600  | 35.6 | 16.2 | 5.04  | 35.5 | 5.07  | 0.1  | -0.6 |
| 5700  | 35.4 | 16.2 | 5.15  | 35.4 | 5.17  | 0.0  | -0.3 |
| 5800  | 35.2 | 16.3 | 5.27  | 35.3 | 5.27  | -0.2 | 0.0  |
| 6000  | 34.9 | 16.5 | 5.50  | 35.1 | 5.48  | -0.6 | 0.5  |
| 6500  | 34.0 | 16.9 | 6.12  | 34.5 | 6.07  | -1.4 | 0.9  |
| 7000  | 33.1 | 17.3 | 6.74  | 33.9 | 6.65  | -2.3 | 1.3  |
| 7500  | 32.2 | 17.6 | 7.36  | 33.3 | 7.24  | -3.2 | 1.6  |
| 8000  | 31.4 | 17.9 | 7.97  | 32.7 | 7.84  | -4.1 | 1.7  |
| 8500  | 30.5 | 18.2 | 8.59  | 32.1 | 8.45  | -5.0 | 1.6  |
| 9000  | 29.7 | 18.4 | 9.20  | 31.5 | 9.08  | -5.9 | 1.3  |
| 9500  | 28.9 | 18.5 | 9.80  | 31.0 | 9.71  | -6.8 | 0.9  |
| 10000 | 28.1 | 18.7 | 10.40 | 30.4 | 10.36 | -7.6 | 0.4  |

Figure B-2  
600 – 5800 MHz Head Tissue Equivalent Matter

|                           |                                      |                                   |
|---------------------------|--------------------------------------|-----------------------------------|
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