

## APPENDIX D: SAR TISSUE SPECIFICATIONS

### Measurement Procedure for Tissue verification:

- 1) The network analyzer and probe system was 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>Ethanediol</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>Alkoxyated 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 D-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.

|                                        |                                |                                   |
|----------------------------------------|--------------------------------|-----------------------------------|
| FCC ID C3K2076                         | RF EXPOSURE PART 1 TEST REPORT | Approved by:<br>Technical Manager |
| DUT Type:<br>Portable Computing Device |                                | APPENDIX D:<br>Page 1 of 2        |

## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HBL600-10000V6)**  
Product No. SL AAH U16 BC (Batch: 240521-1)  
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

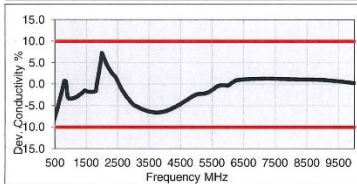
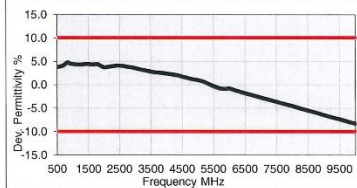
Ambient Condition 22°C ; 30% humidity  
TSL Temperature 22°C  
Test Date 22-May-24  
Operator CL

## Additional Information

TSL Density  
TSL Heat-capacity

## Results

| f [MHz] | Measured |      |       | Target |       | Diff.to Target [%] |         |
|---------|----------|------|-------|--------|-------|--------------------|---------|
|         | e'       | e''  | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 600     | 44.4     | 25.1 | 0.84  | 42.7   | 0.88  | 3.9                | -4.7    |
| 750     | 43.8     | 21.2 | 0.89  | 41.9   | 0.89  | 4.4                | -0.4    |
| 800     | 43.6     | 20.3 | 0.90  | 41.7   | 0.90  | 4.6                | 0.3     |
| 825     | 43.6     | 19.9 | 0.91  | 41.6   | 0.91  | 4.8                | 0.4     |
| 835     | 43.6     | 19.7 | 0.92  | 41.5   | 0.91  | 4.9                | 0.9     |
| 850     | 43.5     | 19.5 | 0.92  | 41.5   | 0.92  | 4.8                | 0.4     |
| 900     | 43.4     | 18.8 | 0.94  | 41.5   | 0.97  | 4.6                | -3.1    |
| 1400    | 42.4     | 14.9 | 1.16  | 40.6   | 1.18  | 4.5                | -1.6    |
| 1450    | 42.3     | 14.7 | 1.18  | 40.5   | 1.20  | 4.4                | -1.7    |
| 1600    | 42.1     | 14.2 | 1.26  | 40.3   | 1.28  | 4.4                | -1.9    |
| 1625    | 42.1     | 14.1 | 1.28  | 40.3   | 1.30  | 4.5                | -1.4    |
| 1640    | 42.1     | 14.1 | 1.29  | 40.3   | 1.31  | 4.6                | -1.2    |
| 1650    | 42.0     | 14.0 | 1.29  | 40.2   | 1.31  | 4.4                | -1.8    |
| 1700    | 41.9     | 13.9 | 1.32  | 40.2   | 1.34  | 4.3                | -1.6    |
| 1750    | 41.8     | 13.8 | 1.35  | 40.1   | 1.37  | 4.3                | -1.5    |
| 1800    | 41.8     | 13.7 | 1.38  | 40.0   | 1.40  | 4.5                | -1.4    |
| 1810    | 41.8     | 13.7 | 1.39  | 40.0   | 1.40  | 4.5                | -0.7    |
| 1825    | 41.8     | 13.7 | 1.40  | 40.0   | 1.40  | 4.5                | 0.0     |
| 1850    | 41.7     | 13.7 | 1.41  | 40.0   | 1.40  | 4.3                | 0.7     |
| 1900    | 41.6     | 13.6 | 1.44  | 40.0   | 1.40  | 4.0                | 2.9     |
| 1950    | 41.5     | 13.5 | 1.47  | 40.0   | 1.40  | 3.8                | 5.0     |
| 2000    | 41.5     | 13.5 | 1.50  | 40.0   | 1.40  | 3.8                | 7.1     |
| 2050    | 41.4     | 13.5 | 1.54  | 39.9   | 1.44  | 3.7                | 6.6     |
| 2100    | 41.3     | 13.4 | 1.57  | 39.8   | 1.49  | 3.7                | 5.4     |
| 2150    | 41.3     | 13.4 | 1.60  | 39.7   | 1.53  | 3.9                | 4.3     |
| 2200    | 41.2     | 13.4 | 1.64  | 39.6   | 1.58  | 3.9                | 3.9     |
| 2250    | 41.1     | 13.4 | 1.68  | 39.6   | 1.62  | 3.9                | 3.6     |
| 2300    | 41.0     | 13.4 | 1.71  | 39.5   | 1.67  | 3.9                | 2.6     |
| 2350    | 41.0     | 13.4 | 1.75  | 39.4   | 1.71  | 4.1                | 2.3     |
| 2400    | 40.9     | 13.4 | 1.79  | 39.3   | 1.76  | 4.1                | 2.0     |
| 2450    | 40.8     | 13.4 | 1.83  | 39.2   | 1.80  | 4.1                | 1.7     |
| 2500    | 40.7     | 13.4 | 1.87  | 39.1   | 1.85  | 4.0                | 0.8     |
| 2550    | 40.7     | 13.4 | 1.91  | 39.1   | 1.91  | 4.2                | 0.0     |
| 2600    | 40.6     | 13.5 | 1.95  | 39.0   | 1.96  | 4.1                | -0.7    |



|       |      |      |       |      |       |      |      |
|-------|------|------|-------|------|-------|------|------|
| 3500  | 39.0 | 14.0 | 2.73  | 37.9 | 2.91  | 2.8  | -6.4 |
| 3700  | 38.7 | 14.1 | 2.91  | 37.7 | 3.12  | 2.6  | -6.6 |
| 5200  | 36.2 | 15.7 | 4.55  | 36.0 | 4.66  | 0.6  | -2.2 |
| 5250  | 36.1 | 15.8 | 4.60  | 35.9 | 4.71  | 0.4  | -2.2 |
| 5300  | 36.0 | 15.8 | 4.66  | 35.9 | 4.76  | 0.3  | -2.1 |
| 5500  | 35.5 | 16.0 | 4.89  | 35.6 | 4.96  | -0.3 | -1.4 |
| 5600  | 35.3 | 16.1 | 5.02  | 35.5 | 5.07  | -0.6 | -0.9 |
| 5700  | 35.1 | 16.2 | 5.15  | 35.4 | 5.17  | -0.8 | -0.4 |
| 5800  | 35.0 | 16.3 | 5.26  | 35.3 | 5.27  | -0.9 | -0.3 |
| 6000  | 34.8 | 16.3 | 5.46  | 35.1 | 5.48  | -0.8 | -0.4 |
| 6500  | 33.8 | 17.0 | 6.14  | 34.5 | 6.07  | -1.8 | 1.1  |
| 7000  | 33.0 | 17.3 | 6.73  | 33.9 | 6.65  | -2.7 | 1.3  |
| 7500  | 32.1 | 17.6 | 7.33  | 33.3 | 7.24  | -3.6 | 1.3  |
| 8000  | 31.2 | 17.8 | 7.93  | 32.7 | 7.84  | -4.6 | 1.2  |
| 8500  | 30.4 | 18.1 | 8.54  | 32.1 | 8.45  | -5.5 | 1.1  |
| 9000  | 29.5 | 18.3 | 9.17  | 31.5 | 9.08  | -6.4 | 1.0  |
| 9500  | 28.7 | 18.5 | 9.78  | 31.0 | 9.71  | -7.4 | 0.7  |
| 10000 | 27.9 | 18.7 | 10.38 | 30.4 | 10.36 | -8.3 | 0.2  |

Figure D-2  
600 – 10000 MHz Head Tissue Equivalent Matter

|                                        |                                |                                   |
|----------------------------------------|--------------------------------|-----------------------------------|
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| DUT Type:<br>Portable Computing Device |                                | APPENDIX D:<br>Page 2 of 2        |