

## APPENDIX D: 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>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>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 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.

|                              |                       |                                   |
|------------------------------|-----------------------|-----------------------------------|
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| DUT Type:<br>Wireless Earbud |                       | APPENDIX D:<br>Page 1 of 2        |

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# Measurement Certificate / Material Test

|              |                                                 |
|--------------|-------------------------------------------------|
| Item Name    | Head Tissue Simulating Liquid (HBBL600-10000V6) |
| Product No.  | SL AAH U16 BC (Batch: 230313-2)                 |
| 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

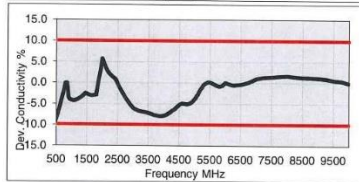
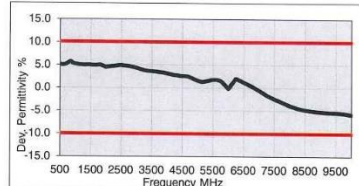
Ambient Condition 22°C ; 30% humidity  
TSL Temperature 22°C  
Test Date 17-Mar-23  
Operator WM

## Additional Information

TSL Density  
TSL Heat-capacity

## Results

| f [MHz] | Measured    |              |       | Target |       |  | Diff. to Target [%] |                |
|---------|-------------|--------------|-------|--------|-------|--|---------------------|----------------|
|         | $\epsilon'$ | $\epsilon''$ | sigma | eps    | sigma |  | $\Delta\epsilon'$   | $\Delta\sigma$ |
| 600     | 44.9        | 24.8         | 0.83  | 42.7   | 0.88  |  | 5.1                 | -5.9           |
| 750     | 44.2        | 21.0         | 0.88  | 41.9   | 0.89  |  | 5.4                 | -1.5           |
| 800     | 44.0        | 20.1         | 0.90  | 41.7   | 0.90  |  | 5.6                 | 0.3            |
| 825     | 44.0        | 19.8         | 0.91  | 41.6   | 0.91  |  | 5.8                 | 0.4            |
| 835     | 44.0        | 19.6         | 0.92  | 41.5   | 0.91  |  | 5.9                 | 0.9            |
| 850     | 43.9        | 19.4         | 0.92  | 41.5   | 0.92  |  | 5.8                 | 0.4            |
| 900     | 43.7        | 18.7         | 0.94  | 41.5   | 0.97  |  | 5.3                 | -3.1           |
| 1400    | 42.6        | 14.7         | 1.15  | 40.6   | 1.18  |  | 4.9                 | -2.5           |
| 1450    | 42.5        | 14.5         | 1.17  | 40.5   | 1.20  |  | 4.9                 | -2.5           |
| 1600    | 42.3        | 14.0         | 1.25  | 40.3   | 1.28  |  | 4.9                 | -2.7           |
| 1625    | 42.3        | 13.9         | 1.26  | 40.3   | 1.30  |  | 5.0                 | -3.0           |
| 1640    | 42.3        | 13.9         | 1.27  | 40.3   | 1.31  |  | 5.1                 | -2.8           |
| 1650    | 42.2        | 13.9         | 1.27  | 40.2   | 1.31  |  | 4.9                 | -3.3           |
| 1700    | 42.1        | 13.8         | 1.30  | 40.2   | 1.34  |  | 4.8                 | -3.1           |
| 1750    | 42.1        | 13.7         | 1.33  | 40.1   | 1.37  |  | 5.0                 | -3.0           |
| 1800    | 42.0        | 13.6         | 1.36  | 40.0   | 1.40  |  | 5.0                 | -2.9           |
| 1810    | 42.0        | 13.6         | 1.37  | 40.0   | 1.40  |  | 5.0                 | -2.1           |
| 1825    | 42.0        | 13.5         | 1.38  | 40.0   | 1.40  |  | 5.0                 | -1.4           |
| 1850    | 42.0        | 13.5         | 1.39  | 40.0   | 1.40  |  | 5.0                 | -0.7           |
| 1900    | 41.9        | 13.4         | 1.42  | 40.0   | 1.40  |  | 4.7                 | 1.4            |
| 1950    | 41.8        | 13.4         | 1.45  | 40.0   | 1.40  |  | 4.5                 | 3.6            |
| 2000    | 41.8        | 13.3         | 1.48  | 40.0   | 1.40  |  | 4.5                 | 5.7            |
| 2050    | 41.7        | 13.3         | 1.51  | 39.9   | 1.44  |  | 4.5                 | 4.5            |
| 2100    | 41.7        | 13.2         | 1.55  | 39.8   | 1.49  |  | 4.7                 | 4.1            |
| 2150    | 41.6        | 13.2         | 1.58  | 39.7   | 1.53  |  | 4.7                 | 3.0            |
| 2200    | 41.5        | 13.2         | 1.62  | 39.6   | 1.58  |  | 4.7                 | 2.7            |
| 2250    | 41.4        | 13.2         | 1.65  | 39.6   | 1.62  |  | 4.7                 | 1.7            |
| 2300    | 41.3        | 13.2         | 1.69  | 39.5   | 1.67  |  | 4.6                 | 1.4            |
| 2350    | 41.3        | 13.3         | 1.73  | 39.4   | 1.71  |  | 4.9                 | 1.1            |
| 2400    | 41.2        | 13.3         | 1.77  | 39.3   | 1.76  |  | 4.9                 | 0.8            |
| 2450    | 41.1        | 13.3         | 1.81  | 39.2   | 1.80  |  | 4.8                 | 0.6            |
| 2500    | 41.1        | 13.3         | 1.85  | 39.1   | 1.85  |  | 5.0                 | -0.2           |
| 2550    | 41.0        | 13.3         | 1.89  | 39.1   | 1.91  |  | 4.9                 | -1.0           |
| 2600    | 40.9        | 13.4         | 1.93  | 39.0   | 1.96  |  | 4.8                 | -1.7           |



|       |      |      |       |      |       |      |      |
|-------|------|------|-------|------|-------|------|------|
| 3500  | 39.3 | 13.9 | 2.70  | 37.9 | 2.91  | 3.6  | -7.2 |
| 3700  | 39.0 | 14.0 | 2.88  | 37.7 | 3.12  | 3.4  | -7.7 |
| 5200  | 36.5 | 15.8 | 4.58  | 36.0 | 4.66  | 1.3  | -1.5 |
| 5250  | 36.4 | 16.0 | 4.66  | 35.9 | 4.71  | 1.4  | -1.0 |
| 5300  | 36.4 | 16.1 | 4.73  | 35.9 | 4.76  | 1.5  | -0.5 |
| 5500  | 36.3 | 16.2 | 4.97  | 35.6 | 4.96  | 1.8  | 0.1  |
| 5600  | 36.2 | 16.2 | 5.06  | 35.5 | 5.07  | 1.8  | -0.2 |
| 5700  | 36.0 | 16.2 | 5.14  | 35.4 | 5.17  | 1.6  | -0.6 |
| 5800  | 35.7 | 16.2 | 5.22  | 35.3 | 5.27  | 1.2  | -0.9 |
| 6000  | 35.0 | 16.4 | 5.48  | 35.1 | 5.48  | -0.2 | 0.1  |
| 6500  | 34.9 | 16.7 | 6.05  | 34.5 | 6.07  | 1.2  | -0.4 |
| 7000  | 33.7 | 17.2 | 6.72  | 33.9 | 6.65  | -0.6 | 1.0  |
| 7500  | 32.5 | 17.6 | 7.34  | 33.3 | 7.24  | -2.5 | 1.4  |
| 8000  | 31.4 | 17.9 | 7.97  | 32.7 | 7.84  | -3.9 | 1.7  |
| 8500  | 30.6 | 18.1 | 8.57  | 32.1 | 8.45  | -4.8 | 1.3  |
| 9000  | 29.9 | 18.3 | 9.18  | 31.5 | 9.08  | -5.2 | 1.2  |
| 9500  | 29.3 | 18.5 | 9.77  | 31.0 | 9.71  | -5.4 | 0.6  |
| 10000 | 28.6 | 18.6 | 10.35 | 30.4 | 10.36 | -5.9 | -0.1 |

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

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