

## 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 A3LSMA356U             | SAR EVALUATION REPORT | Approved by:<br>Technical Manager |
| DUT Type:<br>Portable Handset |                       | APPENDIX D:<br>Page 1 of 3        |

**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**

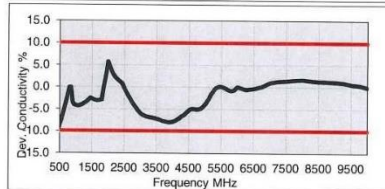
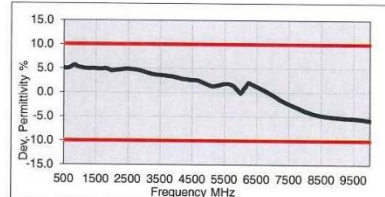
Ambient Condition 22°C ; 30% humidity  
TSL Temperature 22°C  
Test Date 17-Mar-23  
Operator WM

**Additional Information**

TSL Density  
TSL Heat-capacity

**Results**

| f [MHz] | Measured    |              |       | Target |       | Diff.to Target [%] |                 |
|---------|-------------|--------------|-------|--------|-------|--------------------|-----------------|
|         | $\epsilon'$ | $\epsilon''$ | sigma | eps    | sigma | $\Delta$ -eps      | $\Delta$ -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**

|                               |                              |                                   |
|-------------------------------|------------------------------|-----------------------------------|
| FCC ID A3LSMA356U             | <b>SAR EVALUATION REPORT</b> | Approved by:<br>Technical Manager |
| DUT Type:<br>Portable Handset |                              | APPENDIX D:<br>Page 2 of 3        |

**Measurement Certificate / Material Test**

|              |                                             |
|--------------|---------------------------------------------|
| Item Name    | Head Tissue Simulating Liquid (HBBL4-250V3) |
| Product No.  | SL AAH 005 AD (Batch: 230324-2)             |
| Manufacturer | SPEAG                                       |

**Measurement Method**

TSL dielectric parameters measured using calibrated DAK probe.

**Setup Validation**

Validation results were within  $\pm 2.5\%$  towards the target values of Methanol.

**Target Parameters**

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

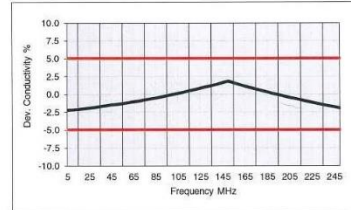
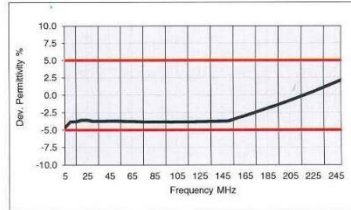
**Test Condition**

|                 |                                                             |
|-----------------|-------------------------------------------------------------|
| Ambient         | Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%. |
| TSL Temperature | 22°C                                                        |
| Test Date       | 27-Mar-23                                                   |
| Operator        | WM                                                          |

**Additional Information**

|                   |                 |
|-------------------|-----------------|
| TSL Density       | 1.042 g/cm3     |
| TSL Heat-capacity | 3.574 kJ/(kg*K) |

| f [MHz] | Measured    |              |       | Target |       |                   | Diff. to Target (%) |  |
|---------|-------------|--------------|-------|--------|-------|-------------------|---------------------|--|
|         | $\epsilon'$ | $\epsilon''$ | sigma | eps    | sigma | $\Delta\epsilon'$ | $\Delta\epsilon''$  |  |
| 5       | 52.9        | 2636.98      | 0.73  | 55.5   | 0.75  | -4.6              | -2.7                |  |
| 10      | 53.3        | 1318.71      | 0.73  | 55.5   | 0.75  | -3.9              | -2.7                |  |
| 15      | 53.2        | 879.92       | 0.73  | 55.3   | 0.75  | -3.9              | -2.7                |  |
| 20      | 53.1        | 660.54       | 0.73  | 55.1   | 0.75  | -3.6              | -2.7                |  |
| 25      | 53.0        | 528.94       | 0.74  | 55.0   | 0.75  | -3.6              | -1.3                |  |
| 30      | 52.9        | 441.24       | 0.74  | 55.0   | 0.75  | -3.8              | -1.3                |  |
| 35      | 52.8        | 379.63       | 0.74  | 54.9   | 0.75  | -3.8              | -1.3                |  |
| 40      | 52.7        | 331.71       | 0.74  | 54.8   | 0.75  | -3.8              | -1.3                |  |
| 45      | 52.6        | 295.25       | 0.74  | 54.7   | 0.75  | -3.8              | -1.4                |  |
| 50      | 52.5        | 266.12       | 0.74  | 54.6   | 0.75  | -3.8              | -1.4                |  |
| 55      | 52.4        | 242.31       | 0.74  | 54.4   | 0.75  | -3.7              | -1.5                |  |
| 60      | 52.3        | 222.50       | 0.74  | 54.3   | 0.75  | -3.7              | -1.5                |  |
| 65      | 52.2        | 205.74       | 0.74  | 54.2   | 0.75  | -3.7              | -1.6                |  |
| 70      | 52.0        | 191.40       | 0.75  | 54.1   | 0.75  | -3.9              | -0.3                |  |
| 75      | 51.9        | 178.98       | 0.75  | 54.0   | 0.75  | -3.9              | -0.4                |  |
| 80      | 51.8        | 168.13       | 0.75  | 53.9   | 0.75  | -3.9              | -0.4                |  |
| 85      | 51.7        | 158.56       | 0.75  | 53.8   | 0.75  | -3.8              | -0.5                |  |
| 90      | 51.6        | 150.06       | 0.75  | 53.7   | 0.75  | -3.8              | -0.5                |  |
| 95      | 51.5        | 142.46       | 0.75  | 53.5   | 0.75  | -3.8              | -0.6                |  |
| 100     | 51.4        | 135.63       | 0.75  | 53.4   | 0.75  | -3.8              | -0.6                |  |
| 105     | 51.3        | 129.46       | 0.76  | 53.3   | 0.76  | -3.8              | 0.6                 |  |
| 110     | 51.1        | 123.86       | 0.76  | 53.2   | 0.76  | -3.9              | 0.6                 |  |
| 115     | 51.0        | 118.75       | 0.76  | 53.1   | 0.76  | -3.9              | 0.5                 |  |
| 120     | 50.9        | 114.07       | 0.76  | 53.0   | 0.76  | -3.9              | 0.5                 |  |
| 125     | 50.8        | 109.77       | 0.76  | 52.9   | 0.76  | -3.9              | 0.4                 |  |
| 130     | 50.7        | 105.80       | 0.77  | 52.8   | 0.76  | -3.9              | 1.7                 |  |
| 135     | 50.6        | 102.13       | 0.77  | 52.6   | 0.76  | -3.9              | 1.6                 |  |
| 140     | 50.5        | 98.73        | 0.77  | 52.5   | 0.76  | -3.9              | 1.6                 |  |
| 145     | 50.4        | 95.56        | 0.77  | 52.4   | 0.76  | -3.8              | 1.5                 |  |
| 150     | 50.3        | 92.61        | 0.77  | 52.3   | 0.76  | -3.8              | 1.5                 |  |
| 155     | 50.3        | 89.86        | 0.77  | 52.1   | 0.76  | -3.4              | 1.0                 |  |
| 160     | 50.2        | 87.27        | 0.78  | 51.8   | 0.77  | -3.1              | 1.8                 |  |
| 165     | 50.1        | 84.85        | 0.78  | 51.6   | 0.77  | -2.9              | 1.3                 |  |
| 170     | 50.0        | 82.57        | 0.78  | 51.4   | 0.77  | -2.7              | 0.8                 |  |
| 175     | 49.9        | 80.42        | 0.78  | 51.1   | 0.78  | -2.4              | 0.4                 |  |
| 180     | 49.8        | 78.39        | 0.78  | 50.9   | 0.78  | -2.2              | -0.1                |  |
| 185     | 49.7        | 76.48        | 0.79  | 50.7   | 0.78  | -1.9              | 0.7                 |  |
| 190     | 49.6        | 74.67        | 0.79  | 50.4   | 0.79  | -1.6              | 0.2                 |  |
| 195     | 49.5        | 72.95        | 0.79  | 50.2   | 0.79  | -1.4              | -0.2                |  |
| 200     | 49.4        | 71.32        | 0.79  | 50.0   | 0.80  | -1.1              | -0.7                |  |
| 205     | 49.3        | 69.77        | 0.80  | 49.7   | 0.80  | -0.9              | 0.1                 |  |
| 210     | 49.3        | 68.30        | 0.80  | 49.5   | 0.80  | -0.4              | -0.4                |  |
| 215     | 49.2        | 66.90        | 0.80  | 49.3   | 0.81  | -0.1              | -0.8                |  |
| 220     | 49.1        | 65.56        | 0.80  | 49.0   | 0.81  | 0.1               | -1.3                |  |
| 225     | 49.0        | 64.29        | 0.80  | 48.8   | 0.81  | 0.4               | -1.7                |  |
| 230     | 48.9        | 63.07        | 0.81  | 48.6   | 0.82  | 0.7               | -0.9                |  |
| 235     | 48.9        | 61.90        | 0.81  | 48.3   | 0.82  | 1.2               | -1.4                |  |
| 240     | 48.8        | 60.78        | 0.81  | 48.1   | 0.82  | 1.5               | -1.8                |  |
| 245     | 48.7        | 59.71        | 0.81  | 47.9   | 0.83  | 1.7               | -2.2                |  |
| 250     | 48.6        | 58.69        | 0.82  | 47.6   | 0.83  | 2.0               | -1.5                |  |



**Figure D-3**  
**5– 250 MHz Head Tissue Equivalent Matter**

|                               |                              |                                   |
|-------------------------------|------------------------------|-----------------------------------|
| FCC ID A3LSMA356U             | <b>SAR EVALUATION REPORT</b> | Approved by:<br>Technical Manager |
| DUT Type:<br>Portable Handset |                              | APPENDIX D:<br>Page 3 of 3        |