

## Head Tissue Simulating Liquids

| Head Tissue                                  | Parameters according to IEEE Std 1528-2013 / IEC 62209 / FCC KDB 865664 D01 |                             |                         |
|----------------------------------------------|-----------------------------------------------------------------------------|-----------------------------|-------------------------|
| <b>Narrow-Band Solutions (±5% tolerance)</b> | <b>Product</b>                                                              | <b>Test Frequency (MHz)</b> | <b>Main Ingredients</b> |
|                                              | HSL300V2                                                                    | 300                         | Water, Sugar            |
|                                              | HSL450V2                                                                    | 450                         | Water, Sugar            |
|                                              | HSL750V2                                                                    | 750                         | Water, Sugar            |
|                                              | HSL900V2                                                                    | 835, 900                    | Water, Sugar            |
|                                              | HSL1450V2                                                                   | 1450, 1500, 1640            | Water, DGBE             |
|                                              | HSL1750V2                                                                   | 1750                        | Water, DGBE             |
|                                              | HSL1800V2                                                                   | 1800, 1900                  | Water, DGBE             |
|                                              | HSL1900V2                                                                   | 1900                        | Water, DGBE             |
|                                              | HSL1950V2                                                                   | 1950, 2000                  | Water, DGBE             |
|                                              | HSL2450V2                                                                   | 2450, 2600                  | Water, DGBE             |
| <b>Broad-Band Solutions (±5% tolerance)</b>  | <b>Product</b>                                                              | <b>Test Frequency (MHz)</b> | <b>Main Ingredients</b> |
|                                              | HBBL30-250V3                                                                | 30-250                      | Water, Tween            |
|                                              | HBBL1350-1850V3                                                             | 1400-1800                   | Water, Tween            |
|                                              | HBBL1550-1950V3                                                             | 1750-1900                   | Water, Tween            |
|                                              | HBBL1900-3800V3                                                             | 1950-3000                   | Water, Tween            |
|                                              | HBBL3500-5800V5                                                             | 3500-5800                   | Water, Oil              |

## Body Tissue Simulating Liquids

| Body Tissue (Muscle)                         | Parameters according to FCC KDB 865664 D01 |                             |                         |
|----------------------------------------------|--------------------------------------------|-----------------------------|-------------------------|
| <b>Narrow-Band Solutions (±5% tolerance)</b> | <b>Product</b>                             | <b>Test Frequency (MHz)</b> | <b>Main Ingredients</b> |
|                                              | MSL300V2                                   | 300                         | Water, Sugar            |
|                                              | MSL450V2                                   | 400, 450                    | Water, Sugar            |
|                                              | MSL750V2                                   | 750                         | Water, Sugar            |
|                                              | MSL900V2                                   | 835, 900                    | Water, Sugar            |
|                                              | MSL1450V2                                  | 1450, 1500, 1640            | Water, DGBE             |
|                                              | MSL1750V2                                  | 1750                        | Water, DGBE             |
|                                              | MSL1800V2                                  | 1800, 1900                  | Water, DGBE             |
|                                              | MSL1900V2                                  | 1900                        | Water, DGBE             |
|                                              | MSL1950V2                                  | 1950, 2100                  | Water, DGBE             |
|                                              | MSL2450V2                                  | 2450, 2600                  | Water, DGBE             |
| <b>Broad-Band Solutions (±5% tolerance)</b>  | <b>Product</b>                             | <b>Test Frequency (MHz)</b> | <b>Main Ingredients</b> |
|                                              | MBBL130-250V3                              | 130-250                     | Water, Tween            |
|                                              | MBBL1350-1850V3                            | 1350-1800                   | Water, Tween            |
|                                              | MBBL1550-1950V3                            | 1550-1850                   | Water, Tween            |
|                                              | MBBL1900-3800V3                            | 1950-3800                   | Water, Tween            |
|                                              | MBBL3500-5800V5                            | 3500-5800                   | Water, Oil              |

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## Measurement Certificate / Material Test

|              |                                                 |
|--------------|-------------------------------------------------|
| Item Name    | <b>Head Tissue Simulating Liquid (HSL750V2)</b> |
| Product No.  | SL AAH 075 AA (Charge: 140210-5)                |
| Manufacturer | SPEAG                                           |

### Measurement Method

TSL dielectric parameters measured using calibrated OCP 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.

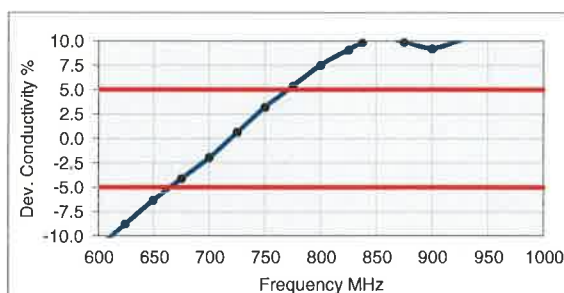
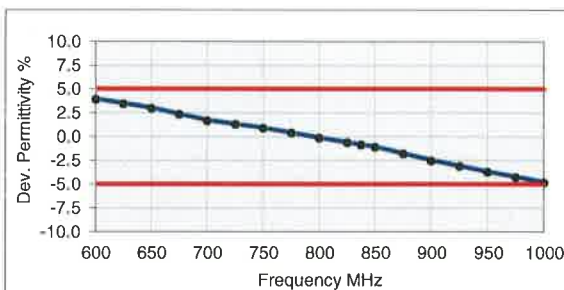
### Test Condition

|                 |                                                             |
|-----------------|-------------------------------------------------------------|
| Ambient         | Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%. |
| TSL Temperature | 22°C                                                        |
| Test Date       | 12-Feb-14                                                   |
| Operator        | IEN                                                         |

### Additional Information

|                   |                         |
|-------------------|-------------------------|
| TSL Density       | 1.284 g/cm <sup>3</sup> |
| TSL Heat-capacity | 2.701 kJ/(kg*K)         |

| f [MHz]    | Measured    |              |             | Target      |             | Diff.to Target [%] |            |
|------------|-------------|--------------|-------------|-------------|-------------|--------------------|------------|
|            | HP-e'       | HP-e''       | sigma       | eps         | sigma       |                    |            |
| 600        | 44.4        | 23.49        | 0.78        | 42.7        | 0.88        | 3.9                | -11.1      |
| 625        | 44.1        | 23.23        | 0.81        | 42.6        | 0.88        | 3.5                | -8.6       |
| 650        | 43.7        | 22.96        | 0.83        | 42.5        | 0.89        | 3.0                | -6.2       |
| 675        | 43.3        | 22.68        | 0.85        | 42.3        | 0.89        | 2.4                | -4.1       |
| 700        | 42.9        | 22.40        | 0.87        | 42.2        | 0.89        | 1.7                | -1.9       |
| 725        | 42.6        | 22.25        | 0.90        | 42.1        | 0.89        | 1.3                | 0.7        |
| <b>750</b> | <b>42.3</b> | <b>22.10</b> | <b>0.92</b> | <b>41.9</b> | <b>0.89</b> | <b>0.9</b>         | <b>3.2</b> |
| 775        | 42.0        | 21.89        | 0.94        | 41.8        | 0.90        | 0.4                | 5.4        |
| 800        | 41.6        | 21.67        | 0.96        | 41.7        | 0.90        | -0.1               | 7.5        |
| 825        | 41.3        | 21.55        | 0.99        | 41.6        | 0.91        | -0.6               | 9.0        |
| 838        | 41.2        | 21.49        | 1.00        | 41.5        | 0.91        | -0.8               | 9.8        |
| 850        | 41.1        | 21.42        | 1.01        | 41.5        | 0.92        | -1.1               | 10.6       |
| 875        | 40.8        | 21.29        | 1.04        | 41.5        | 0.94        | -1.8               | 9.9        |
| 900        | 40.5        | 21.15        | 1.06        | 41.5        | 0.97        | -2.5               | 9.2        |
| 925        | 40.2        | 21.01        | 1.08        | 41.5        | 0.98        | -3.1               | 10.0       |
| 950        | 39.9        | 20.87        | 1.10        | 41.4        | 0.99        | -3.7               | 10.9       |
| 975        | 39.6        | 20.79        | 1.13        | 41.4        | 1.00        | -4.3               | 12.2       |
| 1000       | 39.4        | 20.71        | 1.15        | 41.3        | 1.01        | -4.8               | 13.5       |



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## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HSL900V2)**  
 Product No. SL AAH 090 BB (Charge: 140205-4)  
 Manufacturer SPEAG

### Measurement Method

TSL dielectric parameters measured using calibrated OCP 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.

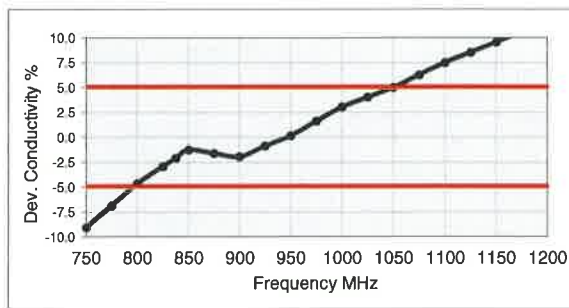
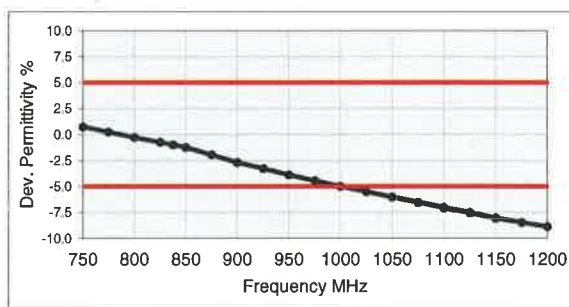
### Test Condition

Ambient Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.  
 TSL Temperature 22°C  
 Test Date 12-Feb-14  
 Operator IEN

### Additional Information

TSL Density 1.280 g/cm<sup>3</sup>  
 TSL Heat-capacity 2.942 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-ε'    | HP-ε'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 700     | 42.9     | 19.58  | 0.76  | 42.2   | 0.89  | 1.6                | -14.3   |
| 725     | 42.6     | 19.52  | 0.79  | 42.1   | 0.89  | 1.2                | -11.7   |
| 750     | 42.3     | 19.47  | 0.81  | 41.9   | 0.89  | 0.8                | -9.1    |
| 775     | 41.9     | 19.35  | 0.83  | 41.8   | 0.90  | 0.3                | -6.8    |
| 800     | 41.6     | 19.23  | 0.86  | 41.7   | 0.90  | -0.3               | -4.6    |
| 825     | 41.3     | 19.18  | 0.88  | 41.6   | 0.91  | -0.7               | -2.9    |
| 838     | 41.1     | 19.16  | 0.89  | 41.5   | 0.91  | -1.0               | -2.1    |
| 850     | 41.0     | 19.13  | 0.90  | 41.5   | 0.92  | -1.2               | -1.2    |
| 875     | 40.7     | 19.07  | 0.93  | 41.5   | 0.94  | -1.9               | -1.6    |
| 900     | 40.4     | 19.00  | 0.95  | 41.5   | 0.97  | -2.7               | -1.9    |
| 925     | 40.1     | 18.92  | 0.97  | 41.5   | 0.98  | -3.3               | -0.9    |
| 950     | 39.8     | 18.85  | 1.00  | 41.4   | 0.99  | -3.9               | 0.2     |
| 975     | 39.6     | 18.82  | 1.02  | 41.4   | 1.00  | -4.4               | 1.6     |
| 1000    | 39.3     | 18.80  | 1.05  | 41.3   | 1.01  | -5.0               | 3.0     |
| 1025    | 39.0     | 18.71  | 1.07  | 41.3   | 1.03  | -5.5               | 4.0     |
| 1050    | 38.8     | 18.62  | 1.09  | 41.2   | 1.04  | -6.0               | 5.0     |
| 1075    | 38.5     | 18.59  | 1.11  | 41.2   | 1.05  | -6.5               | 6.3     |
| 1100    | 38.3     | 18.55  | 1.14  | 41.2   | 1.06  | -7.0               | 7.5     |
| 1125    | 38.0     | 18.50  | 1.16  | 41.1   | 1.07  | -7.5               | 8.5     |
| 1150    | 37.8     | 18.44  | 1.18  | 41.1   | 1.08  | -8.0               | 9.6     |
| 1175    | 37.5     | 18.39  | 1.20  | 41.0   | 1.09  | -8.4               | 10.6    |
| 1200    | 37.3     | 18.35  | 1.22  | 41.0   | 1.10  | -8.9               | 11.6    |



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## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HSL1750V2)**  
 Product No. SL AAH 175 (Charge: 120907-2)  
 Manufacturer SPEAG

### Measurement Method

TSL dielectric parameters measured using calibrated OCP 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.

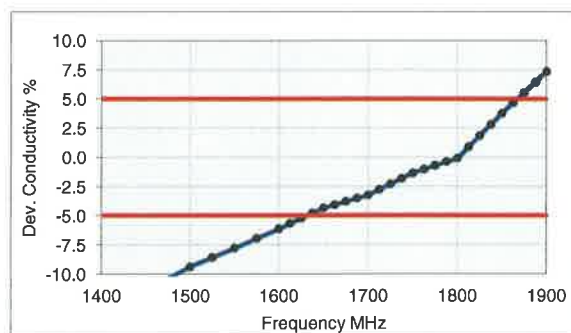
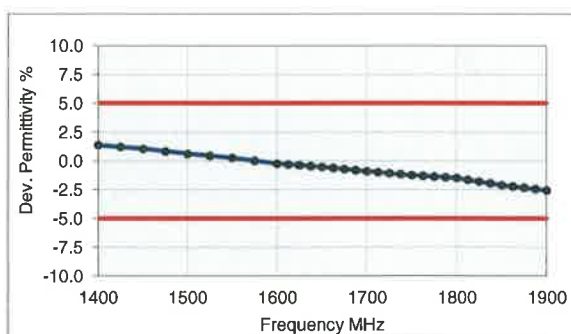
### Test Condition

Ambient Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.  
 TSL Temperature 22°C  
 Test Date 13-Sep-12  
 Operator CL

### Additional Information

TSL Density 0.998 g/cm<sup>3</sup>  
 TSL Heat-capacity 3.572 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-ε'    | HP-ε'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 1400    | 41.2     | 13.09  | 1.02  | 40.6   | 1.18  | 1.4                | -13.6   |
| 1425    | 41.0     | 13.14  | 1.04  | 40.5   | 1.19  | 1.2                | -12.4   |
| 1450    | 40.9     | 13.19  | 1.06  | 40.5   | 1.20  | 1.1                | -11.3   |
| 1475    | 40.8     | 13.26  | 1.09  | 40.5   | 1.21  | 0.8                | -10.3   |
| 1500    | 40.7     | 13.34  | 1.11  | 40.4   | 1.23  | 0.6                | -9.4    |
| 1525    | 40.6     | 13.39  | 1.14  | 40.4   | 1.24  | 0.4                | -8.6    |
| 1550    | 40.5     | 13.44  | 1.16  | 40.4   | 1.26  | 0.3                | -7.8    |
| 1575    | 40.3     | 13.49  | 1.18  | 40.3   | 1.27  | 0.0                | -6.9    |
| 1600    | 40.2     | 13.55  | 1.21  | 40.3   | 1.28  | -0.2               | -6.1    |
| 1613    | 40.2     | 13.58  | 1.22  | 40.3   | 1.29  | -0.3               | -5.7    |
| 1625    | 40.1     | 13.62  | 1.23  | 40.3   | 1.30  | -0.4               | -5.2    |
| 1638    | 40.1     | 13.65  | 1.24  | 40.3   | 1.31  | -0.5               | -4.8    |
| 1650    | 40.0     | 13.68  | 1.26  | 40.2   | 1.31  | -0.5               | -4.3    |
| 1663    | 40.0     | 13.70  | 1.27  | 40.2   | 1.32  | -0.6               | -4.1    |
| 1675    | 39.9     | 13.71  | 1.28  | 40.2   | 1.33  | -0.7               | -3.8    |
| 1688    | 39.8     | 13.72  | 1.29  | 40.2   | 1.33  | -0.8               | -3.5    |
| 1700    | 39.8     | 13.73  | 1.30  | 40.2   | 1.34  | -0.9               | -3.2    |
| 1713    | 39.7     | 13.77  | 1.31  | 40.1   | 1.35  | -1.0               | -2.7    |
| 1725    | 39.7     | 13.81  | 1.33  | 40.1   | 1.36  | -1.1               | -2.3    |
| 1738    | 39.6     | 13.85  | 1.34  | 40.1   | 1.36  | -1.2               | -1.8    |
| 1750    | 39.6     | 13.89  | 1.35  | 40.1   | 1.37  | -1.3               | -1.4    |
| 1763    | 39.5     | 13.91  | 1.36  | 40.1   | 1.38  | -1.3               | -1.0    |
| 1775    | 39.5     | 13.93  | 1.38  | 40.0   | 1.39  | -1.4               | -0.7    |
| 1788    | 39.4     | 13.95  | 1.39  | 40.0   | 1.39  | -1.4               | -0.4    |
| 1800    | 39.4     | 13.97  | 1.40  | 40.0   | 1.40  | -1.5               | -0.1    |
| 1813    | 39.3     | 14.01  | 1.41  | 40.0   | 1.40  | -1.7               | 0.9     |
| 1825    | 39.3     | 14.04  | 1.43  | 40.0   | 1.40  | -1.8               | 1.8     |
| 1838    | 39.2     | 14.08  | 1.44  | 40.0   | 1.40  | -2.0               | 2.8     |
| 1850    | 39.2     | 14.11  | 1.45  | 40.0   | 1.40  | -2.1               | 3.8     |
| 1863    | 39.1     | 14.14  | 1.47  | 40.0   | 1.40  | -2.2               | 4.7     |
| 1875    | 39.1     | 14.17  | 1.48  | 40.0   | 1.40  | -2.3               | 5.6     |
| 1888    | 39.0     | 14.19  | 1.49  | 40.0   | 1.40  | -2.5               | 6.5     |
| 1900    | 39.0     | 14.22  | 1.50  | 40.0   | 1.40  | -2.6               | 7.4     |



## Measurement Certificate / Material Test

|              |                                          |
|--------------|------------------------------------------|
| Item Name    | Head Tissue Simulating Liquid (HSL 1900) |
| Product No.  | SL AAH 190 AA (Charge: 120112-1)         |
| Manufacturer | SPEAG                                    |

### Measurement Method

TSL dielectric parameters measured using calibrated OCP probe (type DAK).

### Target Parameters

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

### Test Condition

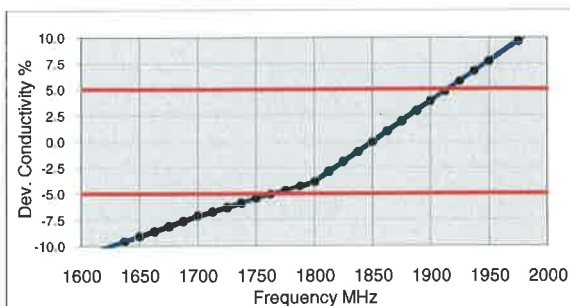
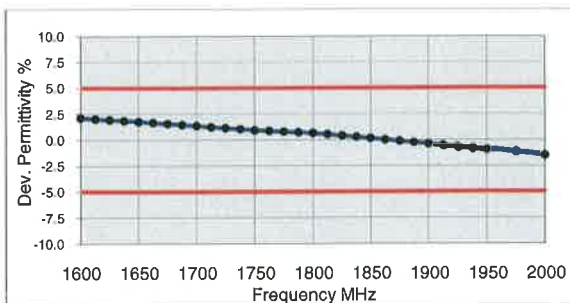
Ambient Condition 22°C ; 30% humidity  
 TSL Temperature 22°C  
 Test Date 18-Jan-12

### Additional Information

TSL Density 0.985 g/cm<sup>3</sup>  
 TSL Heat-capacity 3.710 kJ/(kg\*K)

### Results

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-ε'    | HP-ε'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 1600    | 41.2     | 12.84  | 1.14  | 40.3   | 1.28  | 2.1                | -11.0   |
| 1613    | 41.1     | 12.88  | 1.16  | 40.3   | 1.29  | 2.0                | -10.5   |
| 1625    | 41.1     | 12.93  | 1.17  | 40.3   | 1.30  | 1.9                | -10.0   |
| 1638    | 41.0     | 12.97  | 1.18  | 40.3   | 1.31  | 1.8                | -9.5    |
| 1650    | 40.9     | 13.01  | 1.19  | 40.2   | 1.31  | 1.8                | -9.1    |
| 1663    | 40.9     | 13.05  | 1.21  | 40.2   | 1.32  | 1.7                | -8.6    |
| 1675    | 40.8     | 13.10  | 1.22  | 40.2   | 1.33  | 1.6                | -8.1    |
| 1688    | 40.8     | 13.14  | 1.23  | 40.2   | 1.33  | 1.4                | -7.6    |
| 1700    | 40.7     | 13.18  | 1.25  | 40.2   | 1.34  | 1.3                | -7.1    |
| 1713    | 40.6     | 13.22  | 1.26  | 40.1   | 1.35  | 1.2                | -6.7    |
| 1725    | 40.6     | 13.25  | 1.27  | 40.1   | 1.36  | 1.1                | -6.3    |
| 1738    | 40.5     | 13.28  | 1.28  | 40.1   | 1.36  | 1.0                | -5.9    |
| 1750    | 40.5     | 13.31  | 1.30  | 40.1   | 1.37  | 0.9                | -5.5    |
| 1763    | 40.4     | 13.35  | 1.31  | 40.1   | 1.38  | 0.9                | -5.1    |
| 1775    | 40.4     | 13.38  | 1.32  | 40.0   | 1.39  | 0.8                | -4.7    |
| 1788    | 40.3     | 13.41  | 1.33  | 40.0   | 1.39  | 0.7                | -4.3    |
| 1800    | 40.3     | 13.44  | 1.35  | 40.0   | 1.40  | 0.6                | -3.9    |
| 1813    | 40.2     | 13.48  | 1.36  | 40.0   | 1.40  | 0.5                | -2.9    |
| 1825    | 40.2     | 13.52  | 1.37  | 40.0   | 1.40  | 0.4                | -2.0    |
| 1838    | 40.1     | 13.55  | 1.39  | 40.0   | 1.40  | 0.3                | -1.0    |
| 1850    | 40.1     | 13.59  | 1.40  | 40.0   | 1.40  | 0.1                | -0.1    |
| 1863    | 40.0     | 13.63  | 1.41  | 40.0   | 1.40  | 0.0                | 0.9     |
| 1875    | 39.9     | 13.67  | 1.43  | 40.0   | 1.40  | -0.1               | 1.9     |
| 1888    | 39.9     | 13.71  | 1.44  | 40.0   | 1.40  | -0.3               | 2.9     |
| 1900    | 39.8     | 13.75  | 1.45  | 40.0   | 1.40  | -0.4               | 3.8     |
| 1913    | 39.8     | 13.79  | 1.47  | 40.0   | 1.40  | -0.5               | 4.8     |
| 1925    | 39.7     | 13.83  | 1.48  | 40.0   | 1.40  | -0.7               | 5.8     |
| 1938    | 39.7     | 13.86  | 1.49  | 40.0   | 1.40  | -0.8               | 6.7     |
| 1950    | 39.6     | 13.90  | 1.51  | 40.0   | 1.40  | -0.9               | 7.7     |
| 1975    | 39.5     | 13.97  | 1.53  | 40.0   | 1.40  | -1.2               | 9.6     |
| 2000    | 39.4     | 14.04  | 1.56  | 40.0   | 1.40  | -1.5               | 11.6    |



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## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HSL1950V2)**  
 Product No. SL AAH 195 CA (Charge: 120717-3)  
 Manufacturer SPEAG

### Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

### Setup Validation

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

### Target Parameters

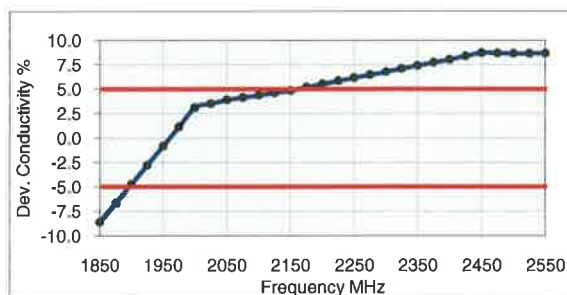
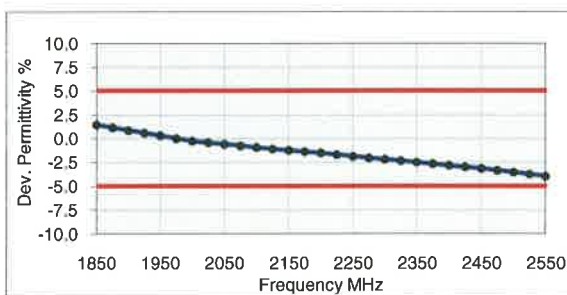
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

### Test Condition

Ambient Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.  
 TSL Temperature 22°C  
 Test Date 18-Jul-12  
 Operator DI

TSL Density 0.995 g/cm<sup>3</sup>  
 TSL Heat-capacity 3.720 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-ε'    | HP-ε'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 1850    | 40.6     | 12.43  | 1.28  | 40.0   | 1.40  | 1.5                | -8.6    |
| 1875    | 40.5     | 12.53  | 1.31  | 40.0   | 1.40  | 1.2                | -6.7    |
| 1900    | 40.3     | 12.62  | 1.33  | 40.0   | 1.40  | 0.9                | -4.7    |
| 1925    | 40.2     | 12.71  | 1.36  | 40.0   | 1.40  | 0.6                | -2.8    |
| 1950    | 40.1     | 12.80  | 1.39  | 40.0   | 1.40  | 0.3                | -0.8    |
| 1975    | 40.0     | 12.89  | 1.42  | 40.0   | 1.40  | 0.0                | 1.1     |
| 2000    | 39.9     | 12.98  | 1.44  | 40.0   | 1.40  | -0.3               | 3.1     |
| 2025    | 39.8     | 13.07  | 1.47  | 40.0   | 1.42  | -0.4               | 3.5     |
| 2050    | 39.7     | 13.16  | 1.50  | 39.9   | 1.44  | -0.6               | 3.9     |
| 2075    | 39.6     | 13.23  | 1.53  | 39.9   | 1.47  | -0.8               | 4.2     |
| 2100    | 39.5     | 13.30  | 1.55  | 39.8   | 1.49  | -0.9               | 4.4     |
| 2125    | 39.3     | 13.37  | 1.58  | 39.8   | 1.51  | -1.1               | 4.6     |
| 2150    | 39.2     | 13.44  | 1.61  | 39.7   | 1.53  | -1.2               | 4.9     |
| 2175    | 39.1     | 13.52  | 1.64  | 39.7   | 1.56  | -1.4               | 5.2     |
| 2200    | 39.1     | 13.61  | 1.67  | 39.6   | 1.58  | -1.5               | 5.5     |
| 2225    | 38.9     | 13.68  | 1.69  | 39.6   | 1.60  | -1.7               | 5.9     |
| 2250    | 38.8     | 13.76  | 1.72  | 39.6   | 1.62  | -1.9               | 6.2     |
| 2275    | 38.7     | 13.83  | 1.75  | 39.5   | 1.64  | -2.0               | 6.5     |
| 2300    | 38.6     | 13.91  | 1.78  | 39.5   | 1.67  | -2.2               | 6.8     |
| 2325    | 38.5     | 13.98  | 1.81  | 39.4   | 1.69  | -2.3               | 7.1     |
| 2350    | 38.4     | 14.06  | 1.84  | 39.4   | 1.71  | -2.5               | 7.4     |
| 2375    | 38.3     | 14.13  | 1.87  | 39.3   | 1.73  | -2.7               | 7.7     |
| 2400    | 38.2     | 14.21  | 1.90  | 39.3   | 1.76  | -2.8               | 8.0     |
| 2425    | 38.1     | 14.28  | 1.93  | 39.2   | 1.78  | -3.0               | 8.4     |
| 2450    | 38.0     | 14.36  | 1.96  | 39.2   | 1.80  | -3.1               | 8.7     |
| 2475    | 37.9     | 14.42  | 1.99  | 39.2   | 1.83  | -3.3               | 8.7     |
| 2500    | 37.8     | 14.49  | 2.02  | 39.1   | 1.85  | -3.5               | 8.7     |
| 2525    | 37.6     | 14.56  | 2.04  | 39.1   | 1.88  | -3.7               | 8.7     |
| 2550    | 37.5     | 14.62  | 2.07  | 39.1   | 1.91  | -3.9               | 8.7     |
| 2575    | 37.4     | 14.69  | 2.10  | 39.0   | 1.94  | -4.1               | 8.7     |
| 2600    | 37.3     | 14.76  | 2.13  | 39.0   | 1.96  | -4.3               | 8.7     |



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## Measurement Certificate / Material Test

|              |                                           |
|--------------|-------------------------------------------|
| Item Name    | Head Tissue Simulating Liquid (HSL2450V2) |
| Product No.  | SL AAH 245 BA (Charge: 130430-3)          |
| Manufacturer | SPEAG                                     |

### Measurement Method

TSL dielectric parameters measured using calibrated OCP 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.

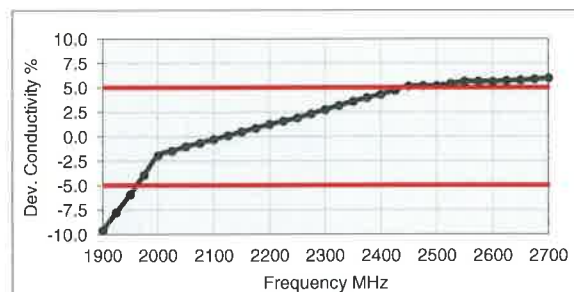
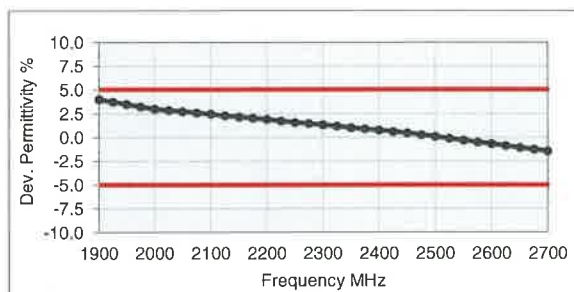
### Test Condition

Ambient Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.  
 TSL Temperature **23°C**  
 Test Date 2-May-13  
 Operator CL

### Additional Information

TSL Density 0.988 g/cm<sup>3</sup>  
 TSL Heat-capacity 3.680 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |                 |
|---------|----------|--------|-------|--------|-------|--------------------|-----------------|
|         | HP-e'    | HP-e'' | sigma | eps    | sigma | $\Delta$ -eps      | $\Delta$ -sigma |
| 1900    | 41.6     | 11.98  | 1.27  | 40.0   | 1.40  | 4.0                | -9.6            |
| 1925    | 41.5     | 12.06  | 1.29  | 40.0   | 1.40  | 3.8                | -7.7            |
| 1950    | 41.4     | 12.15  | 1.32  | 40.0   | 1.40  | 3.5                | -5.9            |
| 1975    | 41.3     | 12.24  | 1.35  | 40.0   | 1.40  | 3.3                | -3.9            |
| 2000    | 41.2     | 12.34  | 1.37  | 40.0   | 1.40  | 3.0                | -1.9            |
| 2025    | 41.1     | 12.44  | 1.40  | 40.0   | 1.42  | 2.9                | -1.5            |
| 2050    | 41.0     | 12.54  | 1.43  | 39.9   | 1.44  | 2.8                | -1.0            |
| 2075    | 40.9     | 12.62  | 1.46  | 39.9   | 1.47  | 2.6                | -0.6            |
| 2100    | 40.8     | 12.71  | 1.48  | 39.8   | 1.49  | 2.5                | -0.3            |
| 2125    | 40.7     | 12.80  | 1.51  | 39.8   | 1.51  | 2.3                | 0.1             |
| 2150    | 40.6     | 12.88  | 1.54  | 39.7   | 1.53  | 2.2                | 0.5             |
| 2175    | 40.5     | 12.97  | 1.57  | 39.7   | 1.56  | 2.0                | 0.9             |
| 2200    | 40.4     | 13.05  | 1.60  | 39.6   | 1.58  | 1.9                | 1.3             |
| 2225    | 40.3     | 13.13  | 1.63  | 39.6   | 1.60  | 1.7                | 1.6             |
| 2250    | 40.2     | 13.21  | 1.65  | 39.6   | 1.62  | 1.6                | 1.9             |
| 2275    | 40.1     | 13.30  | 1.68  | 39.5   | 1.64  | 1.5                | 2.4             |
| 2300    | 40.0     | 13.39  | 1.71  | 39.5   | 1.67  | 1.3                | 2.8             |
| 2325    | 39.9     | 13.48  | 1.74  | 39.4   | 1.69  | 1.2                | 3.2             |
| 2350    | 39.8     | 13.56  | 1.77  | 39.4   | 1.71  | 1.0                | 3.6             |
| 2375    | 39.7     | 13.64  | 1.80  | 39.3   | 1.73  | 0.9                | 4.0             |
| 2400    | 39.6     | 13.72  | 1.83  | 39.3   | 1.76  | 0.8                | 4.3             |
| 2425    | 39.5     | 13.80  | 1.86  | 39.2   | 1.78  | 0.6                | 4.8             |
| 2450    | 39.4     | 13.89  | 1.89  | 39.2   | 1.80  | 0.5                | 5.2             |
| 2475    | 39.3     | 13.96  | 1.92  | 39.2   | 1.83  | 0.3                | 5.2             |
| 2500    | 39.2     | 14.03  | 1.95  | 39.1   | 1.85  | 0.1                | 5.2             |
| 2525    | 39.1     | 14.12  | 1.98  | 39.1   | 1.88  | -0.1               | 5.4             |
| 2550    | 39.0     | 14.22  | 2.02  | 39.1   | 1.91  | -0.3               | 5.6             |
| 2575    | 38.9     | 14.28  | 2.05  | 39.0   | 1.94  | -0.5               | 5.6             |
| 2600    | 38.7     | 14.34  | 2.07  | 39.0   | 1.96  | -0.7               | 5.6             |
| 2625    | 38.6     | 14.41  | 2.10  | 39.0   | 1.99  | -0.9               | 5.7             |
| 2650    | 38.5     | 14.48  | 2.13  | 38.9   | 2.02  | -1.1               | 5.8             |
| 2675    | 38.4     | 14.55  | 2.17  | 38.9   | 2.05  | -1.3               | 5.9             |
| 2700    | 38.3     | 14.62  | 2.20  | 38.9   | 2.07  | -1.4               | 6.0             |



## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HBBL1550-1950V3)**  
 Product No. SL AAH 181 AA (Charge: 140206-3)  
 Manufacturer SPEAG

### Measurement Method

TSL dielectric parameters measured using calibrated OCP 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.

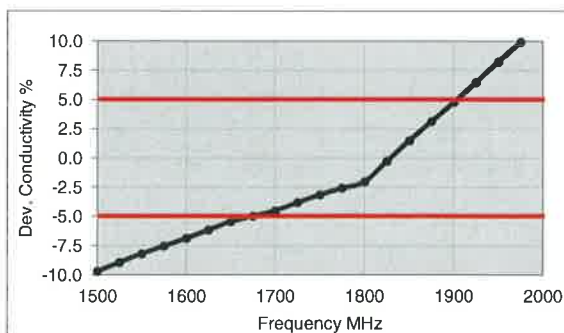
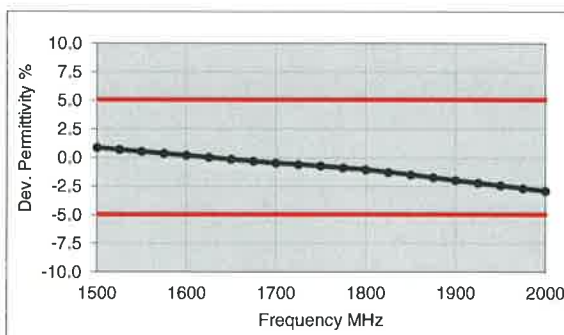
### Test Condition

Ambient Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.  
 TSL Temperature 22°C  
 Test Date 12-Feb-14  
 Operator IEN

### Additional Information

TSL Density 1.052 g/cm<sup>3</sup>  
 TSL Heat-capacity 3.322 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-ε'    | HP-ε'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 1500    | 40.8     | 13.29  | 1.11  | 40.4   | 1.23  | 0.9                | -9.7    |
| 1525    | 40.7     | 13.34  | 1.13  | 40.4   | 1.24  | 0.7                | -8.9    |
| 1550    | 40.6     | 13.38  | 1.15  | 40.4   | 1.26  | 0.6                | -8.2    |
| 1575    | 40.5     | 13.41  | 1.17  | 40.3   | 1.27  | 0.4                | -7.5    |
| 1600    | 40.4     | 13.44  | 1.20  | 40.3   | 1.28  | 0.2                | -6.9    |
| 1625    | 40.3     | 13.48  | 1.22  | 40.3   | 1.30  | 0.1                | -6.2    |
| 1650    | 40.2     | 13.53  | 1.24  | 40.2   | 1.31  | -0.1               | -5.4    |
| 1675    | 40.1     | 13.54  | 1.26  | 40.2   | 1.33  | -0.3               | -5.0    |
| 1700    | 40.0     | 13.55  | 1.28  | 40.2   | 1.34  | -0.4               | -4.5    |
| 1725    | 39.9     | 13.60  | 1.30  | 40.1   | 1.36  | -0.6               | -3.8    |
| 1750    | 39.8     | 13.64  | 1.33  | 40.1   | 1.37  | -0.7               | -3.1    |
| 1775    | 39.7     | 13.67  | 1.35  | 40.0   | 1.39  | -0.9               | -2.6    |
| 1800    | 39.6     | 13.70  | 1.37  | 40.0   | 1.40  | -1.0               | -2.0    |
| 1825    | 39.5     | 13.75  | 1.40  | 40.0   | 1.40  | -1.2               | -0.3    |
| 1850    | 39.4     | 13.81  | 1.42  | 40.0   | 1.40  | -1.5               | 1.5     |
| 1875    | 39.3     | 13.84  | 1.44  | 40.0   | 1.40  | -1.7               | 3.1     |
| 1900    | 39.2     | 13.88  | 1.47  | 40.0   | 1.40  | -2.0               | 4.8     |
| 1925    | 39.1     | 13.92  | 1.49  | 40.0   | 1.40  | -2.2               | 6.5     |
| 1950    | 39.0     | 13.97  | 1.52  | 40.0   | 1.40  | -2.4               | 8.3     |
| 1975    | 38.9     | 14.01  | 1.54  | 40.0   | 1.40  | -2.6               | 10.0    |
| 2000    | 38.8     | 14.05  | 1.56  | 40.0   | 1.40  | -2.9               | 11.6    |



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## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HBBL1900-3800V3)**  
 Product No. SL AAH 196 AB (Charge: 131212-1)  
 Manufacturer SPEAG

### Measurement Method

TSL dielectric parameters measured using calibrated OCP 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.

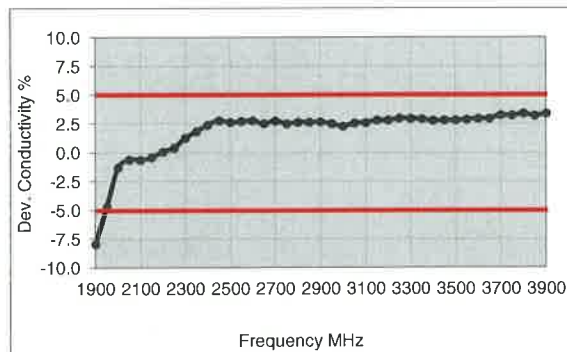
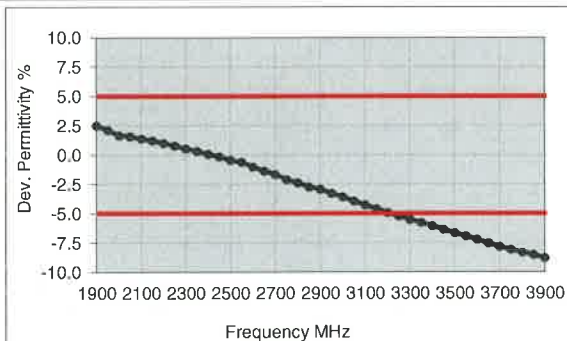
### Test Condition

Ambient Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.  
 TSL Temperature 22°C  
 Test Date 18-Dec-13  
 Operator IEN

### Additional Information

TSL Density 1.054 g/cm<sup>3</sup>  
 TSL Heat-capacity 3.389 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |                 |
|---------|----------|--------|-------|--------|-------|--------------------|-----------------|
|         | HP-e'    | HP-e'' | sigma | eps    | sigma | $\Delta$ -eps      | $\Delta$ -sigma |
| 1900    | 41.0     | 12.2   | 1.3   | 40.0   | 1.4   | 2.5                | -7.9            |
| 1950    | 40.8     | 12.3   | 1.3   | 40.0   | 1.4   | 2.1                | -4.7            |
| 2000    | 40.7     | 12.4   | 1.4   | 40.0   | 1.4   | 1.7                | -1.3            |
| 2050    | 40.5     | 12.6   | 1.4   | 39.9   | 1.4   | 1.6                | -0.6            |
| 2100    | 40.4     | 12.7   | 1.5   | 39.8   | 1.5   | 1.4                | -0.6            |
| 2150    | 40.2     | 12.8   | 1.5   | 39.7   | 1.5   | 1.2                | -0.4            |
| 2200    | 40.0     | 12.9   | 1.6   | 39.6   | 1.6   | 1.0                | 0.1             |
| 2250    | 39.9     | 13.0   | 1.6   | 39.6   | 1.6   | 0.8                | 0.4             |
| 2300    | 39.7     | 13.2   | 1.7   | 39.5   | 1.7   | 0.5                | 1.3             |
| 2350    | 39.5     | 13.3   | 1.7   | 39.4   | 1.7   | 0.3                | 1.8             |
| 2400    | 39.3     | 13.5   | 1.8   | 39.3   | 1.8   | 0.1                | 2.4             |
| 2450    | 39.1     | 13.6   | 1.9   | 39.2   | 1.8   | -0.1               | 2.8             |
| 2500    | 39.0     | 13.7   | 1.9   | 39.1   | 1.9   | -0.4               | 2.6             |
| 2550    | 38.8     | 13.8   | 2.0   | 39.1   | 1.9   | -0.6               | 2.7             |
| 2600    | 38.6     | 14.0   | 2.0   | 39.0   | 2.0   | -1.0               | 2.8             |
| 2650    | 38.4     | 14.0   | 2.1   | 38.9   | 2.0   | -1.4               | 2.5             |
| 2700    | 38.2     | 14.2   | 2.1   | 38.9   | 2.1   | -1.7               | 2.7             |
| 2750    | 38.0     | 14.3   | 2.2   | 38.8   | 2.1   | -2.1               | 2.5             |
| 2800    | 37.8     | 14.4   | 2.2   | 38.8   | 2.2   | -2.4               | 2.6             |
| 2850    | 37.6     | 14.5   | 2.3   | 38.7   | 2.2   | -2.7               | 2.6             |
| 2900    | 37.5     | 14.6   | 2.4   | 38.6   | 2.3   | -2.9               | 2.6             |
| 2950    | 37.3     | 14.6   | 2.4   | 38.6   | 2.3   | -3.3               | 2.5             |
| 3000    | 37.1     | 14.7   | 2.5   | 38.5   | 2.4   | -3.6               | 2.3             |
| 3050    | 36.9     | 14.8   | 2.5   | 38.4   | 2.5   | -3.9               | 2.6             |
| 3100    | 36.7     | 14.9   | 2.6   | 38.4   | 2.5   | -4.3               | 2.6             |
| 3150    | 36.6     | 15.0   | 2.6   | 38.3   | 2.6   | -4.6               | 2.8             |
| 3200    | 36.4     | 15.0   | 2.7   | 38.3   | 2.6   | -4.9               | 2.8             |
| 3250    | 36.2     | 15.1   | 2.7   | 38.2   | 2.7   | -5.2               | 3.0             |
| 3300    | 36.1     | 15.2   | 2.8   | 38.2   | 2.7   | -5.5               | 3.0             |
| 3350    | 35.9     | 15.2   | 2.8   | 38.1   | 2.8   | -5.8               | 2.9             |
| 3400    | 35.7     | 15.3   | 2.9   | 38.0   | 2.8   | -6.0               | 2.8             |
| 3450    | 35.6     | 15.3   | 2.9   | 38.0   | 2.9   | -6.3               | 2.8             |
| 3500    | 35.4     | 15.4   | 3.0   | 37.9   | 2.9   | -6.6               | 2.8             |
| 3550    | 35.3     | 15.4   | 3.0   | 37.9   | 3.0   | -6.9               | 2.9             |
| 3600    | 35.1     | 15.5   | 3.1   | 37.8   | 3.0   | -7.2               | 2.9             |
| 3650    | 34.9     | 15.5   | 3.2   | 37.8   | 3.1   | -7.5               | 2.9             |
| 3700    | 34.7     | 15.6   | 3.2   | 37.7   | 3.1   | -7.8               | 3.2             |
| 3750    | 34.6     | 15.7   | 3.3   | 37.6   | 3.2   | -8.1               | 3.2             |
| 3800    | 34.5     | 15.7   | 3.3   | 37.6   | 3.2   | -8.3               | 3.4             |
| 3850    | 34.3     | 15.8   | 3.4   | 37.5   | 3.3   | -8.5               | 3.2             |



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## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HBBL3500-5800V5)**  
 Product No. SL AAH 502 AB (Charge: 130123-1)  
 Manufacturer SPEAG

### Measurement Method

TSL dielectric parameters measured using calibrated OCP 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 23-Jan-13  
 Operator DI

### Additional Information

TSL Density 0.985 g/cm<sup>3</sup>  
 TSL Heat-capacity 3.383 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-e'    | HP-e'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 3400    | 38.8     | 15.03  | 2.84  | 38.0   | 2.81  | 1.9                | 1.2     |
| 3500    | 38.6     | 15.00  | 2.92  | 37.9   | 2.91  | 1.8                | 0.3     |
| 3600    | 38.5     | 14.98  | 3.00  | 37.8   | 3.02  | 1.7                | -0.5    |
| 3700    | 38.4     | 14.97  | 3.08  | 37.7   | 3.12  | 1.7                | -1.2    |
| 3800    | 38.2     | 14.95  | 3.16  | 37.6   | 3.22  | 1.7                | -1.8    |
| 3900    | 38.1     | 14.96  | 3.25  | 37.5   | 3.32  | 1.7                | -2.3    |
| 4000    | 38.0     | 14.99  | 3.34  | 37.4   | 3.43  | 1.8                | -2.6    |
| 4100    | 37.9     | 15.03  | 3.43  | 37.2   | 3.53  | 1.8                | -2.8    |
| 4200    | 37.8     | 15.06  | 3.52  | 37.1   | 3.63  | 1.8                | -3.0    |
| 4300    | 37.7     | 15.13  | 3.62  | 37.0   | 3.73  | 1.8                | -3.1    |
| 4400    | 37.6     | 15.20  | 3.72  | 36.9   | 3.84  | 1.8                | -3.0    |
| 4500    | 37.4     | 15.23  | 3.81  | 36.8   | 3.94  | 1.7                | -3.2    |
| 4600    | 37.3     | 15.30  | 3.92  | 36.7   | 4.04  | 1.6                | -3.1    |
| 4700    | 37.1     | 15.35  | 4.01  | 36.6   | 4.14  | 1.5                | -3.1    |
| 4800    | 37.0     | 15.41  | 4.11  | 36.4   | 4.25  | 1.5                | -3.1    |
| 4850    | 36.9     | 15.45  | 4.17  | 36.4   | 4.30  | 1.5                | -3.0    |
| 4900    | 36.8     | 15.49  | 4.22  | 36.3   | 4.35  | 1.4                | -2.9    |
| 4950    | 36.8     | 15.51  | 4.27  | 36.3   | 4.40  | 1.4                | -2.9    |
| 5000    | 36.7     | 15.54  | 4.32  | 36.2   | 4.45  | 1.4                | -2.9    |
| 5050    | 36.6     | 15.57  | 4.37  | 36.2   | 4.50  | 1.3                | -2.8    |
| 5100    | 36.6     | 15.60  | 4.42  | 36.1   | 4.55  | 1.3                | -2.8    |
| 5150    | 36.5     | 15.63  | 4.48  | 36.0   | 4.60  | 1.2                | -2.7    |
| 5200    | 36.4     | 15.67  | 4.53  | 36.0   | 4.66  | 1.2                | -2.6    |
| 5250    | 36.3     | 15.68  | 4.58  | 35.9   | 4.71  | 1.1                | -2.7    |
| 5300    | 36.2     | 15.71  | 4.63  | 35.9   | 4.76  | 1.0                | -2.6    |
| 5350    | 36.2     | 15.74  | 4.68  | 35.8   | 4.81  | 1.0                | -2.6    |
| 5400    | 36.1     | 15.78  | 4.74  | 35.8   | 4.86  | 0.9                | -2.5    |
| 5450    | 36.0     | 15.78  | 4.78  | 35.7   | 4.91  | 0.9                | -2.6    |
| 5500    | 36.0     | 15.79  | 4.83  | 35.6   | 4.96  | 0.9                | -2.6    |
| 5550    | 35.9     | 15.84  | 4.89  | 35.6   | 5.01  | 0.9                | -2.5    |
| 5600    | 35.8     | 15.86  | 4.94  | 35.5   | 5.07  | 0.8                | -2.5    |
| 5650    | 35.8     | 15.91  | 5.00  | 35.5   | 5.12  | 0.8                | -2.2    |
| 5700    | 35.7     | 15.91  | 5.05  | 35.4   | 5.17  | 0.8                | -2.4    |
| 5750    | 35.6     | 15.97  | 5.11  | 35.4   | 5.22  | 0.7                | -2.1    |
| 5800    | 35.5     | 15.98  | 5.16  | 35.3   | 5.27  | 0.7                | -2.1    |
| 5850    | 35.5     | 16.01  | 5.21  | 35.3   | 5.34  | 0.5                | -2.4    |
| 5900    | 35.4     | 16.05  | 5.27  | 35.3   | 5.40  | 0.3                | -2.4    |

