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## Measurement Certificate / Material Test

Item Name	<b>Head Tissue Simulating Liquid (HSL2450V2)</b>
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.

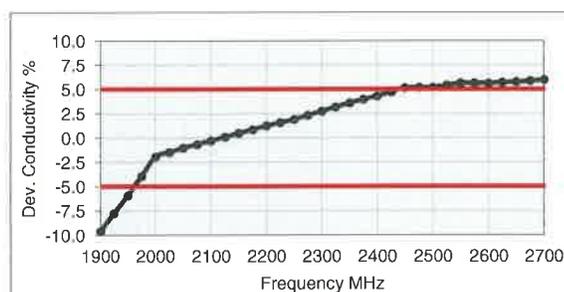
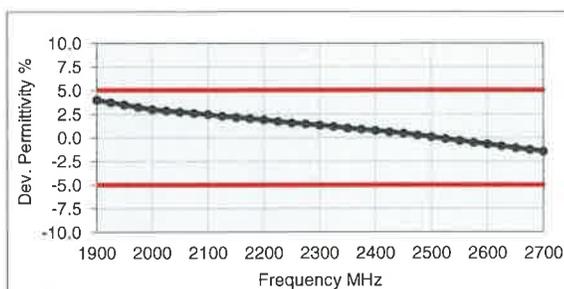
### Test Condition

Ambient	Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.
TSL Temperature	<b>23°C</b>
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
<b>2300</b>	<b>40.0</b>	<b>13.39</b>	<b>1.71</b>	<b>39.5</b>	<b>1.67</b>	<b>1.3</b>	<b>2.8</b>
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
<b>2450</b>	<b>39.4</b>	<b>13.89</b>	<b>1.89</b>	<b>39.2</b>	<b>1.80</b>	<b>0.5</b>	<b>5.2</b>
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
<b>2600</b>	<b>38.7</b>	<b>14.34</b>	<b>2.07</b>	<b>39.0</b>	<b>1.96</b>	<b>-0.7</b>	<b>5.6</b>
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 (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.

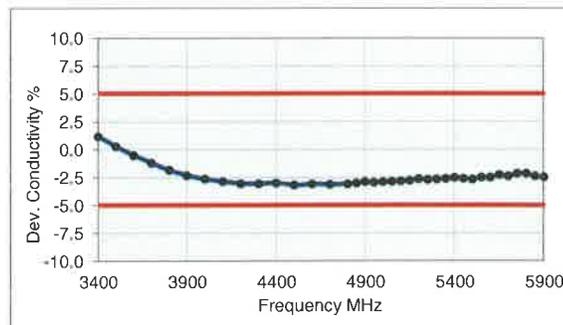
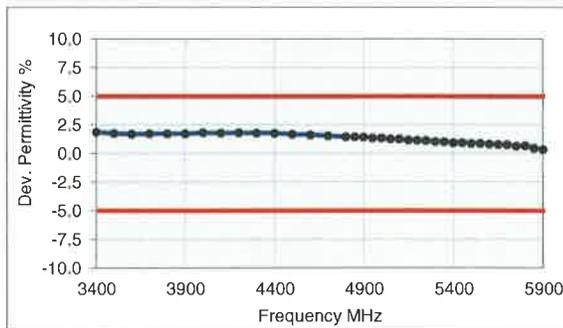
### Test Condition

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	$\Delta$ -eps	$\Delta$ -sigma
3400	38.8	15.03	2.84	38.0	2.81	1.9	1.2
<b>3500</b>	<b>38.6</b>	<b>15.00</b>	<b>2.92</b>	<b>37.9</b>	<b>2.91</b>	<b>1.8</b>	<b>0.3</b>
3600	38.5	14.98	3.00	37.8	3.02	1.7	-0.5
<b>3700</b>	<b>38.4</b>	<b>14.97</b>	<b>3.08</b>	<b>37.7</b>	<b>3.12</b>	<b>1.7</b>	<b>-1.2</b>
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
<b>5200</b>	<b>36.4</b>	<b>15.67</b>	<b>4.53</b>	<b>36.0</b>	<b>4.66</b>	<b>1.2</b>	<b>-2.6</b>
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
<b>5500</b>	<b>36.0</b>	<b>15.79</b>	<b>4.83</b>	<b>35.6</b>	<b>4.96</b>	<b>0.9</b>	<b>-2.6</b>
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
<b>5800</b>	<b>35.5</b>	<b>15.98</b>	<b>5.16</b>	<b>35.3</b>	<b>5.27</b>	<b>0.7</b>	<b>-2.1</b>
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



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**Measurement Certificate / Material Test**

Item Name	<b>Head Tissue Simulating Liquid (HBBL600-10000V6)</b>
Product No.	SL AAH U16 BC (Batch: 181106-1)
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**

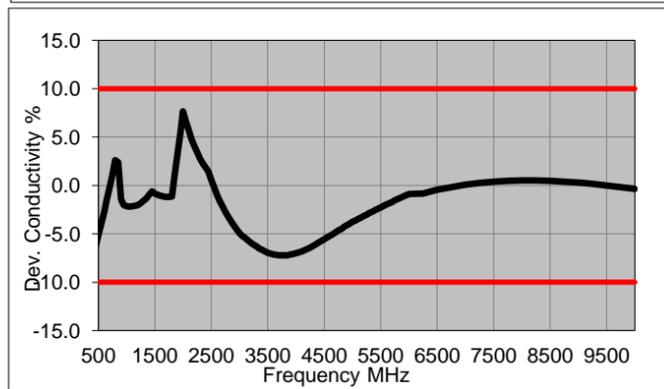
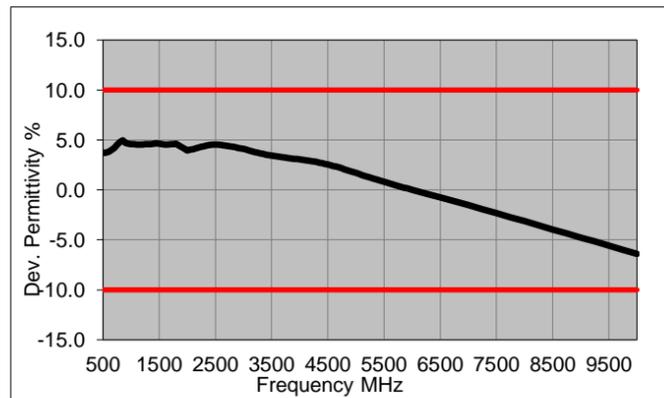
Ambient Condition 22°C ; 30% humidity  
 TSL Temperature 22°C  
 Test Date 7-Nov-18  
 Operator CL

**Additional Information**

TSL Density  
 TSL Heat-capacity

**Results**

f [MHz]	Measured			Target		Diff.to Target [%]	
	e'	e"	sigma	eps	sigma	D-eps	D-sigma
800	43.7	20.7	0.92	41.7	0.90	4.8	2.5
825	43.7	20.3	0.93	41.6	0.91	5.1	2.6
835	43.7	20.1	0.94	41.5	0.91	5.2	3.1
850	43.6	19.8	0.94	41.5	0.92	5.1	2.6
900	43.5	19.1	0.96	41.5	0.97	4.8	-1.0
1400	42.5	15.0	1.17	40.6	1.18	4.7	-0.8
1450	42.4	14.8	1.19	40.5	1.20	4.7	-0.8
1600	42.1	14.3	1.27	40.3	1.28	4.4	-1.1
1625	42.1	14.2	1.29	40.3	1.30	4.5	-0.7
1640	42.1	14.2	1.30	40.3	1.31	4.6	-0.5
1650	42.1	14.1	1.30	40.2	1.31	4.6	-1.0
1700	42.0	14.0	1.33	40.2	1.34	4.6	-0.9
1750	41.9	13.9	1.35	40.1	1.37	4.5	-1.5
1800	41.8	13.8	1.38	40.0	1.40	4.5	-1.4
1810	41.8	13.8	1.39	40.0	1.40	4.5	-0.7
1825	41.8	13.8	1.40	40.0	1.40	4.5	0.0
1850	41.8	13.7	1.41	40.0	1.40	4.5	0.7
1900	41.7	13.7	1.44	40.0	1.40	4.3	2.9
1950	41.6	13.6	1.48	40.0	1.40	4.0	5.7
2000	41.6	13.6	1.51	40.0	1.40	4.0	7.9
2050	41.5	13.5	1.54	39.9	1.44	4.0	6.6
2100	41.5	13.5	1.57	39.8	1.49	4.2	5.4
2150	41.4	13.4	1.61	39.7	1.53	4.2	5.0
2200	41.3	13.4	1.64	39.6	1.58	4.2	3.9
2250	41.3	13.4	1.68	39.6	1.62	4.4	3.6
2300	41.2	13.4	1.71	39.5	1.67	4.4	2.6
2350	41.1	13.4	1.75	39.4	1.71	4.4	2.3
2400	41.1	13.4	1.79	39.3	1.76	4.6	2.0
2450	41.0	13.4	1.83	39.2	1.80	4.6	1.7
2500	40.9	13.4	1.86	39.1	1.85	4.5	0.3
2550	40.8	13.4	1.90	39.1	1.91	4.4	-0.5
2600	40.8	13.5	1.95	39.0	1.96	4.6	-0.7
3500	39.2	13.9	2.71	37.9	2.91	3.4	-6.9
3700	38.9	14.1	2.89	37.7	3.12	3.3	-7.2



5200	36.5	15.6	4.51	36.0	4.66	1.3	-3.2
5250	36.4	15.6	4.56	35.9	4.71	1.2	-3.0
5300	36.3	15.7	4.62	35.9	4.76	1.1	-2.9
5500	35.9	15.9	4.85	35.6	4.96	0.8	-2.3
5600	35.8	15.9	4.96	35.5	5.07	0.6	-2.0
5700	35.6	16.0	5.08	35.4	5.17	0.5	-1.7
5800	35.4	16.1	5.20	35.3	5.27	0.3	-1.4
6000	35.1	16.3	5.43	35.1	5.48	0.0	-0.9
6500	34.2	16.7	6.04	34.5	6.07	-0.7	-0.5
7000	33.4	17.1	6.66	33.9	6.65	-1.5	0.1
7500	32.5	17.4	7.27	33.3	7.24	-2.3	0.4
8000	31.7	17.7	7.88	32.7	7.84	-3.1	0.5
8500	30.9	18.0	8.49	32.1	8.45	-4.0	0.5
9000	30.0	18.2	9.10	31.5	9.08	-4.8	0.3
9500	29.2	18.4	9.71	31.0	9.71	-5.6	0.0
10000	28.4	18.5	10.32	30.4	10.36	-6.4	-0.4