

Body Tissue Simulating Liquids					
Body Tissue (Muscle)	Parameters according to FCC KDB 865664 D01				
Narrow – Band Solutions (±5% tolerance)	Product	Test Frequency [MHz]	Main Ingredients		
	MSL750V2	750	Water, Sugar		
	MSL900V2	835, 900	Water, Sugar		
	MSL1750V2	1750	Water, DGBE		
	MSL1900V2	1900	Water, DGBE		
	MSL2450V2	2450	Water, DGBE		
Broad – Band Solutions (±5% tolerance)	Product	Test Frequency [MHz]	Main Ingredients		
	MBBL3500-5800V5	3500-5800	Water, Oil		

Zeughausstrasse 43, 8004 Zurich, Switzerland
 Phone +41 44 245 9700, Fax +41 44 245 9779
 info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MSL750V2)
Product No.	SL AAM 075 (Charge: 120831-2)
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.

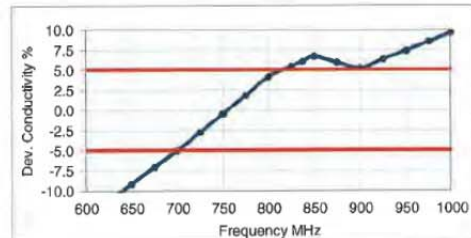
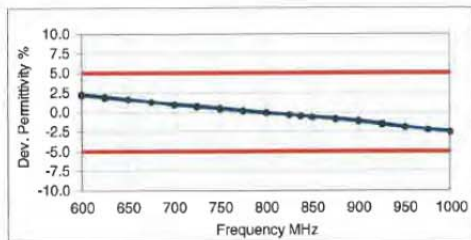
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	5-Sep-12
Operator	CL

Additional Information

TSL Density	1.212 g/cm ³
TSL Heat-capacity	3.006 kJ/(kg·K)

f [MHz]	Measured			Target		Diff. to Target [%]	
	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	57.4	24.67	0.82	56.1	0.95	2.2	-13.5
625	57.1	24.34	0.85	56.0	0.95	1.9	-11.3
650	56.8	24.01	0.87	55.9	0.96	1.6	-9.1
675	56.6	23.71	0.89	55.8	0.96	1.3	-7.1
700	56.3	23.41	0.91	55.7	0.96	1.0	-5.0
725	56.0	23.20	0.94	55.6	0.96	0.7	-2.7
750	55.3	22.99	0.96	55.5	0.96	0.5	-0.4
775	55.5	22.81	0.98	55.4	0.97	0.2	1.9
800	55.3	22.64	1.01	55.3	0.97	-0.1	4.2
825	55.1	22.47	1.03	55.2	0.98	-0.3	5.5
838	54.9	22.39	1.04	55.2	0.98	-0.5	6.1
850	54.8	22.31	1.05	55.2	0.99	-0.6	6.7
875	54.6	22.19	1.08	55.1	1.02	-0.9	6.0
900	54.4	22.07	1.10	55.0	1.05	-1.1	5.2
925	54.1	21.96	1.13	55.0	1.06	-1.5	6.3
950	53.9	21.85	1.15	54.9	1.08	-1.9	7.4
975	53.7	21.75	1.18	54.9	1.09	-2.2	8.5
1000	53.5	21.64	1.20	54.8	1.10	-2.5	9.6



Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MSL900V2)
Product No.	SL AAM 090 CA (Charge: 140124-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup ValidationValidation 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.

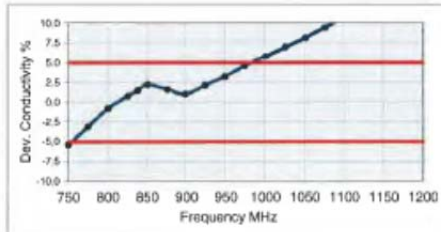
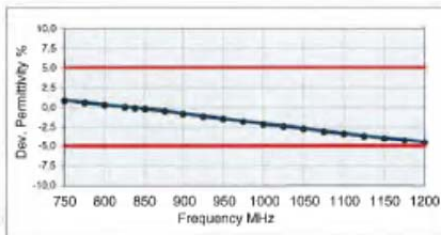
Test Condition

Ambient Environment temperatur (22 ± 3)°C and humidity < 70%.
 TSL Temperature 22°C
 Test Date 29-Jan-14
 Operator IEN

Additional Information

TSL Density 1.208 g/cm³
 TSL Heat-capacity 3.113 kJ/(kg·K)

f (MHz)	Measured			Target		Diff. to Target [%]	
	HP-e'	HP-e''	sigma	eps	sigma	Δ -eps	Δ -sigma
700	56.5	22.21	0.86	55.7	0.96	1.4	-9.9
725	56.3	22.03	0.89	55.6	0.96	1.1	-7.6
750	56.0	21.85	0.91	55.5	0.96	0.9	-5.4
775	55.8	21.71	0.94	55.4	0.97	0.6	-3.1
800	55.5	21.57	0.96	55.3	0.97	0.3	-0.8
825	55.3	21.47	0.99	55.2	0.98	0.1	0.8
838	55.2	21.42	1.00	55.2	0.98	-0.1	1.5
850	55.1	21.37	1.01	55.2	0.99	-0.2	2.2
875	54.8	21.28	1.04	55.1	1.02	-0.5	1.8
900	54.6	21.19	1.06	55.0	1.05	-0.8	1.0
925	54.3	21.10	1.09	55.0	1.06	-1.1	2.1
950	54.1	21.01	1.11	54.9	1.08	-1.5	3.2
975	53.9	20.96	1.14	54.9	1.09	-1.8	4.6
1000	53.7	20.90	1.16	54.8	1.10	-2.1	5.9
1025	53.5	20.82	1.19	54.8	1.11	-2.4	7.0
1050	53.3	20.75	1.21	54.7	1.12	-2.7	8.1
1075	53.0	20.70	1.24	54.7	1.13	-3.0	9.4
1100	52.8	20.66	1.26	54.7	1.14	-3.4	10.6
1125	52.6	20.57	1.29	54.6	1.15	-3.7	11.5
1150	52.4	20.48	1.31	54.6	1.17	-3.9	12.4
1175	52.2	20.47	1.34	54.5	1.18	-4.2	13.7
1200	52.0	20.46	1.37	54.5	1.19	-4.5	15.0



Measurement Certificate / Material Test

Item Name **Body Tissue Simulating Liquid (MSL1750V2)**
 Product No. **SL AAM 175 (Charge: 120919-3)**
 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.

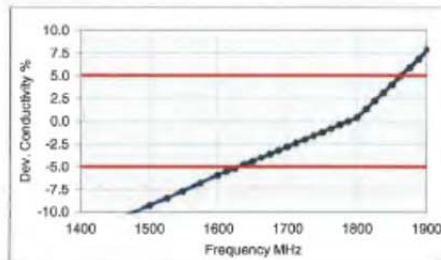
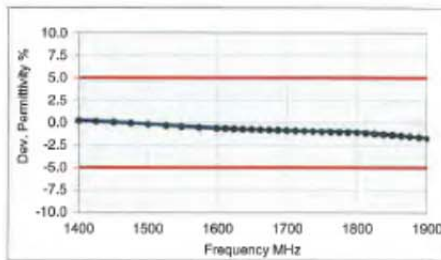
Test Condition

Ambient Environment temperature (22 ± 3)°C and humidity < 70%.
 TSL Temperature 22°C
 Test Date 20-Sep-12
 Operator CL

Additional Information

TSL Density 0.998 g/cm³
 TSL Heat-capacity 3.893 kJ/(kg·K)

f (MHz)	Measured			Target		Diff.to Target [%]	
	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
1400	54.2	14.23	1.11	54.1	1.28	0.2	-13.2
1425	54.1	14.30	1.13	54.0	1.29	0.1	-12.1
1450	54.0	14.36	1.16	54.0	1.30	0.0	-10.9
1475	53.9	14.42	1.18	54.0	1.32	-0.1	-10.0
1500	53.8	14.49	1.21	53.9	1.33	-0.2	-9.2
1525	53.7	14.54	1.23	53.9	1.35	-0.3	-8.4
1550	53.7	14.59	1.26	53.9	1.36	-0.4	-7.7
1575	53.6	14.67	1.29	53.8	1.38	-0.5	-6.8
1600	53.5	14.74	1.31	53.8	1.39	-0.6	-5.9
1613	53.4	14.77	1.32	53.8	1.40	-0.7	-5.5
1625	53.4	14.79	1.34	53.8	1.41	-0.7	-5.1
1638	53.3	14.82	1.35	53.7	1.42	-0.7	-4.7
1650	53.3	14.85	1.36	53.7	1.43	-0.8	-4.4
1663	53.2	14.88	1.38	53.7	1.43	-0.8	-4.0
1675	53.2	14.91	1.39	53.6	1.44	-0.8	-3.6
1688	53.1	14.94	1.40	53.6	1.45	-0.8	-3.2
1700	53.1	14.97	1.42	53.6	1.46	-0.9	-2.8
1713	53.1	15.01	1.43	53.5	1.46	-0.9	-2.4
1725	53.0	15.04	1.44	53.5	1.47	-0.9	-2.0
1738	53.0	15.07	1.46	53.5	1.48	-1.0	-1.6
1750	52.9	15.10	1.47	53.4	1.49	-1.0	-1.2
1763	52.9	15.14	1.48	53.4	1.50	-1.0	-0.8
1775	52.8	15.17	1.50	53.4	1.50	-1.0	-0.4
1788	52.8	15.21	1.51	53.3	1.51	-1.0	0.0
1800	52.7	15.24	1.53	53.3	1.52	-1.1	0.4
1813	52.7	15.27	1.54	53.3	1.52	-1.1	1.3
1825	52.7	15.30	1.55	53.3	1.52	-1.2	2.2
1838	52.6	15.33	1.57	53.3	1.52	-1.3	3.1
1850	52.6	15.37	1.58	53.3	1.52	-1.4	4.0
1863	52.5	15.40	1.60	53.3	1.52	-1.5	5.0
1875	52.5	15.44	1.61	53.3	1.52	-1.5	6.0
1888	52.4	15.48	1.63	53.3	1.52	-1.6	6.9
1900	52.4	15.51	1.64	53.3	1.52	-1.7	7.9



Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MSL1900V2)
Product No.	SL AAM 190 (Charge: 120913-1)
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.

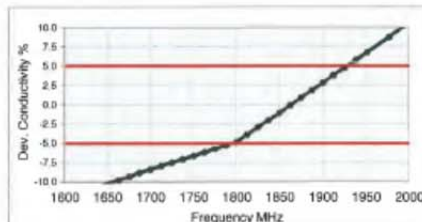
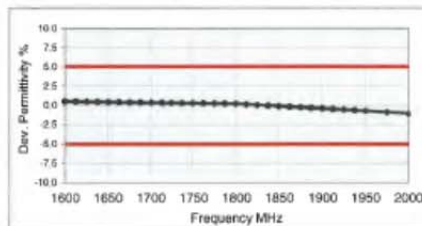
Test Condition

Ambient Environment temperatur (22 ± 3)°C and humidity < 70%
 TSL Temperature 22°C
 Test Date 20-Sep-12
 Operator CL

Additional Information

TSL Density 0.996 g/cm³
 TSL Heat-capacity 3.947 kJ/(kg·K)

	Measured			Target			Diff. to Target [%]	
f [MHz]	HP-e'	HP-e''	sigma	eps	sigma	delta-eps	delta-sigma	
1600	54.1	13.80	1.23	53.8	1.39	0.5	-11.8	
1613	54.1	13.84	1.24	53.8	1.40	0.5	-11.4	
1625	54.0	13.87	1.25	53.8	1.41	0.5	-11.0	
1638	54.0	13.91	1.27	53.7	1.42	0.5	-10.6	
1650	53.9	13.95	1.28	53.7	1.43	0.4	-10.2	
1663	53.9	13.99	1.29	53.7	1.43	0.4	-9.7	
1675	53.8	14.02	1.31	53.6	1.44	0.4	-9.3	
1688	53.8	14.06	1.32	53.6	1.45	0.4	-8.9	
1700	53.8	14.10	1.33	53.6	1.46	0.4	-8.4	
1713	53.7	14.14	1.35	53.5	1.46	0.3	-8.0	
1725	53.7	14.19	1.36	53.5	1.47	0.3	-7.6	
1738	53.6	14.23	1.38	53.5	1.48	0.3	-7.1	
1750	53.6	14.27	1.39	53.4	1.49	0.3	-6.7	
1763	53.5	14.31	1.40	53.4	1.50	0.3	-6.2	
1775	53.5	14.35	1.42	53.4	1.50	0.3	-5.8	
1788	53.5	14.40	1.43	53.3	1.51	0.2	-5.3	
1800	53.4	14.44	1.45	53.3	1.52	0.2	-4.9	
1813	53.4	14.48	1.46	53.3	1.52	0.2	-3.9	
1825	53.3	14.52	1.47	53.3	1.52	0.1	-3.0	
1838	53.3	14.56	1.49	53.3	1.52	0.0	-2.0	
1850	53.3	14.61	1.50	53.3	1.52	-0.1	-1.1	
1863	53.2	14.65	1.52	53.3	1.52	-0.1	-0.1	
1875	53.2	14.69	1.53	53.3	1.52	-0.2	0.8	
1888	53.1	14.74	1.55	53.3	1.52	-0.3	1.8	
1900	53.1	14.78	1.56	53.3	1.52	-0.4	2.8	
1913	53.0	14.83	1.58	53.3	1.52	-0.5	3.8	
1925	53.0	14.87	1.59	53.3	1.52	-0.5	4.8	
1938	53.0	14.91	1.61	53.3	1.52	-0.6	5.7	
1950	52.9	14.95	1.62	53.3	1.52	-0.7	6.7	
1975	52.8	15.03	1.65	53.3	1.52	-0.9	8.7	
2000	52.7	15.11	1.68	53.3	1.52	-1.0	10.6	



Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MSL2450V2)
Product No.	SL AAM 245 BA (Charge: 130510-2)
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.

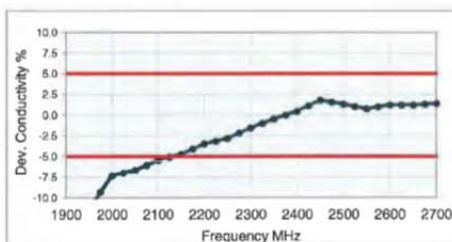
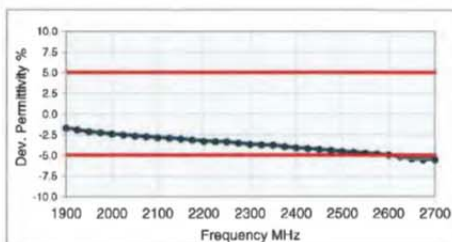
Test Condition

Ambient Environment temperatur (22 ± 3)°C and humidity < 70%.
 TSL Temperature 22°C
 Test Date 15-May-13
 Operator IEN

Additional Information

TSL Density 0.996 g/cm³
 TSL Heat-capacity 3.987 kJ/(kg*K)

f [MHz]	Measured			Target			Diff.to Target [%]	
	HP-ε'	HP-ε''	sigma	eps	sigma		Δ-eps	Δ-sigma
1900	52.4	12.21	1.29	53.3	1.52	-1.7	-15.1	
1925	52.3	12.32	1.32	53.3	1.52	-1.9	-13.2	
1950	52.2	12.43	1.35	53.3	1.52	-2.1	-11.3	
1975	52.1	12.55	1.38	53.3	1.52	-2.2	-9.3	
2000	52.0	12.67	1.41	53.3	1.52	-2.4	-7.3	
2025	51.9	12.75	1.44	53.3	1.54	-2.5	-6.9	
2050	51.8	12.84	1.46	53.2	1.57	-2.6	-6.6	
2075	51.7	12.96	1.50	53.2	1.59	-2.7	-6.0	
2100	51.7	13.09	1.53	53.2	1.62	-2.8	-5.4	
2125	51.6	13.17	1.56	53.1	1.64	-2.9	-5.0	
2150	51.5	13.25	1.58	53.1	1.66	-3.0	-4.7	
2175	51.4	13.37	1.62	53.1	1.69	-3.1	-4.1	
2200	51.3	13.50	1.65	53.0	1.71	-3.3	-3.5	
2225	51.2	13.58	1.68	53.0	1.74	-3.3	-3.1	
2250	51.2	13.65	1.71	53.0	1.76	-3.3	-2.8	
2275	51.1	13.78	1.74	52.9	1.78	-3.5	-2.2	
2300	51.0	13.90	1.78	52.9	1.81	-3.6	-1.5	
2325	50.9	14.01	1.81	52.9	1.83	-3.7	-1.0	
2350	50.9	14.12	1.85	52.8	1.85	-3.8	-0.5	
2375	50.7	14.21	1.88	52.8	1.88	-3.9	0.0	
2400	50.6	14.31	1.91	52.8	1.90	-4.1	0.5	
2425	50.5	14.44	1.95	52.7	1.93	-4.2	1.1	
2450	50.5	14.56	1.99	52.7	1.95	-4.3	1.8	
2475	50.4	14.64	2.02	52.7	1.99	-4.4	1.6	
2500	50.3	14.72	2.05	52.6	2.02	-4.5	1.3	
2525	50.2	14.79	2.08	52.6	2.06	-4.6	1.0	
2550	50.1	14.86	2.11	52.6	2.09	-4.7	0.7	
2575	50.0	15.00	2.15	52.5	2.13	-4.8	1.0	
2600	49.9	15.14	2.19	52.5	2.16	-4.9	1.2	
2625	49.8	15.23	2.22	52.5	2.20	-5.1	1.2	
2650	49.6	15.33	2.26	52.4	2.23	-5.3	1.2	
2675	49.6	15.45	2.30	52.4	2.27	-5.4	1.3	
2700	49.5	15.56	2.34	52.4	2.30	-5.5	1.4	



Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MBBL3500-5800V5)
Product No.	SL AAM 501 EA (Charge: 140114-1)
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 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	15-Jan-14
Operator	IEN

Additional Information

TSL Density	0.996 g/cm ³
TSL Heat-capacity	3.765 kJ/(kg*K)

f [MHz]	Measured			Target		Diff.to Target [%]	
	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
3400	52.2	16.63	3.14	51.5	3.20	1.4	-1.8
3500	52.0	16.67	3.25	51.3	3.31	1.3	-1.9
3600	51.9	16.74	3.35	51.2	3.43	1.4	-2.4
3700	51.7	16.81	3.46	51.1	3.55	1.3	-2.5
3800	51.6	16.90	3.57	50.9	3.66	1.3	-2.6
3900	51.5	16.99	3.69	50.8	3.78	1.4	-2.4
4000	51.3	17.08	3.80	50.6	3.90	1.3	-2.5
4100	51.2	17.18	3.92	50.5	4.01	1.4	-2.4
4200	51.1	17.32	4.05	50.4	4.13	1.4	-2.0
4300	50.9	17.47	4.18	50.2	4.25	1.3	-1.6
4400	50.8	17.61	4.31	50.1	4.37	1.4	-1.3
4500	50.6	17.73	4.44	50.0	4.48	1.3	-0.9
4600	50.4	17.86	4.57	49.8	4.60	1.1	-0.6
4700	50.3	18.00	4.71	49.7	4.72	1.2	-0.1
4800	50.1	18.14	4.84	49.6	4.83	1.1	0.2
4850	50.0	18.20	4.91	49.5	4.89	1.0	0.4
4900	49.9	18.28	4.98	49.4	4.95	1.0	0.6
4950	49.8	18.31	5.04	49.4	5.01	0.9	0.7
5000	49.7	18.38	5.11	49.3	5.07	0.8	0.9
5050	49.6	18.44	5.18	49.2	5.12	0.8	1.1
5100	49.5	18.50	5.25	49.2	5.18	0.7	1.3
5150	49.4	18.57	5.32	49.1	5.24	0.6	1.5
5200	49.4	18.63	5.39	49.0	5.30	0.8	1.7
5250	49.3	18.68	5.46	48.9	5.36	0.7	1.9
5300	49.2	18.75	5.53	48.9	5.42	0.7	2.1
5350	49.1	18.79	5.59	48.8	5.47	0.6	2.1
5400	49.0	18.86	5.66	48.7	5.53	0.5	2.3
5450	48.9	18.90	5.73	48.7	5.59	0.5	2.5
5500	48.8	18.94	5.80	48.6	5.65	0.4	2.7
5550	48.7	19.01	5.87	48.5	5.71	0.3	2.8
5600	48.7	19.06	5.94	48.5	5.77	0.5	3.0
5650	48.6	19.13	6.01	48.4	5.82	0.4	3.2
5700	48.5	19.18	6.08	48.3	5.88	0.3	3.3
5750	48.4	19.26	6.16	48.3	5.94	0.3	3.7
5800	48.3	19.30	6.23	48.2	6.00	0.2	3.8
5850	48.2	19.37	6.30	48.1	6.06	0.1	4.0
5900	48.1	19.43	6.38	48.1	6.12	0.1	4.3

