SAR Tissue Ingredients

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		
	MSL1800V2	1750, 1800	Water, DGBE		
	MSL1950V2	1900, 2000	Water, DGBE		
	MSL2450V2	2450	Water, DGBE		
Broad - Band Solutions (±5% tolerance)	Product	Test Frequency [MHz]	Main Ingredients		
	MBBL3500-5800V5	3500-5800	Water, Oil		

Schmid & Partner Engineering AG

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 (MSL 750)**
Product No.	SL AAM 075 AA (Charge: 111107-3)
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

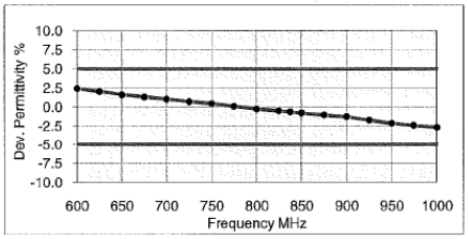
Ambient Condition	22°C ; 30% humidity
TSL Temperature	22°C
Test Date	9-Nov-11

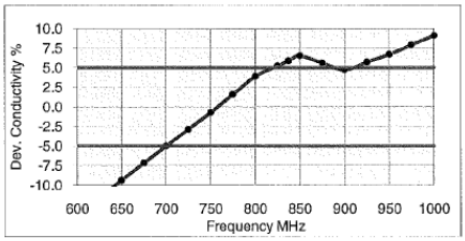
Additional Information

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

Results

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	57.5	24.52	0.82	56.1	0.95	2.4	-14.0
625	57.2	24.24	0.84	56.0	0.95	2.0	-11.7
650	56.8	23.96	0.87	55.9	0.96	1.6	-9.3
675	56.6	23.68	0.89	55.8	0.96	1.3	-7.2
700	56.3	23.41	0.91	55.7	0.96	1.0	-5.0
725	56.0	23.17	0.93	55.6	0.96	0.7	-2.8
750	55.8	22.93	0.96	55.5	0.96	0.4	-0.7
775	55.5	22.75	0.98	55.4	0.97	0.1	1.6
800	55.2	22.58	1.01	55.3	0.97	-0.2	3.9
825	55.0	22.43	1.03	55.2	0.98	-0.5	5.2
838	54.8	22.35	1.04	55.2	0.98	-0.6	5.9
850	54.7	22.27	1.05	55.2	0.99	-0.8	6.5
875	54.5	22.12	1.08	55.1	1.02	-1.0	5.6
900	54.3	21.97	1.10	55.0	1.05	-1.3	4.7
925	54.0	21.84	1.12	55.0	1.06	-1.7	5.7
950	53.8	21.72	1.15	54.9	1.08	-2.1	6.7
975	53.6	21.63	1.17	54.9	1.09	-2.4	7.9
1000	53.4	21.53	1.20	54.8	1.10	-2.7	9.1





Schmid & Partner Engineering AG

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 (MSL900V2)**
Product No.	SL AAM 090 CA (Charge: 130313-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

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

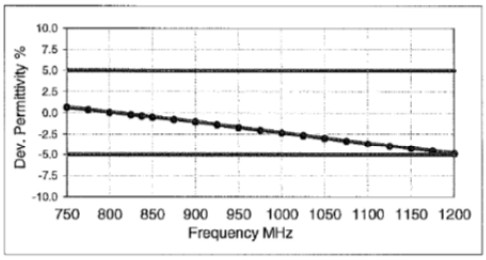
Test Condition

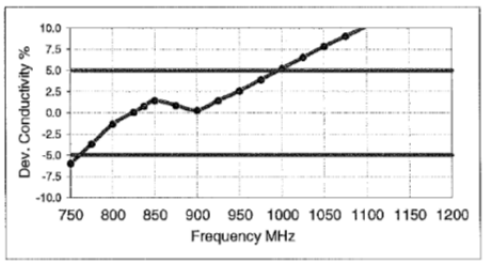
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	13-Mar-13
Operator	IEN

Additional Information

TSL Density	1.294 g/cm^3
TSL Heat-capacity	3.003 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e"	sigma	eps	sigma	Δ-eps	Δ-sigma
700	56.4	22.03	0.86	55.7	0.96	1.3	-10.6
725	56.2	21.87	0.88	55.6	0.96	1.0	-8.3
750	55.9	21.71	0.91	55.5	0.96	0.7	-6.0
775	55.7	21.58	0.93	55.4	0.97	0.4	-3.6
800	55.4	21.45	0.95	55.3	0.97	0.1	-1.3
825	55.1	21.33	0.98	55.2	0.98	-0.2	0.1
838	55.0	21.27	0.99	55.2	0.98	-0.3	0.8
850	54.9	21.21	1.00	55.2	0.99	-0.5	1.5
875	54.7	21.13	1.03	55.1	1.02	-0.7	0.9
900	54.4	21.04	1.05	55.0	1.05	-1.0	0.3
925	54.2	20.96	1.08	55.0	1.06	-1.4	1.5
950	54.0	20.88	1.10	54.9	1.08	-1.7	2.6
975	53.8	20.83	1.13	54.9	1.09	-2.0	4.0
1000	53.6	20.78	1.16	54.8	1.10	-2.3	5.3
1025	53.3	20.74	1.18	54.8	1.11	-2.7	6.6
1050	53.1	20.69	1.21	54.7	1.12	-3.0	7.9
1075	52.9	20.64	1.23	54.7	1.13	-3.3	9.1
1100	52.7	20.59	1.26	54.7	1.14	-3.6	10.2
1125	52.5	20.58	1.29	54.6	1.15	-3.9	11.6
1150	52.3	20.57	1.32	54.6	1.17	-4.2	12.9
1175	52.0	20.53	1.34	54.5	1.18	-4.5	14.0
1200	51.8	20.48	1.37	54.5	1.19	-4.8	15.1





MSL1800V2

f (MHz)	HP-e'	HP-e"	sigma
300	58.68	20.34	0.34
350	58.52	18.25	0.36
400	58.28	16.80	0.37
450	58.17	15.77	0.39
500	57.98	14.94	0.42
550	57.81	14.35	0.44
600	57.62	13.92	0.46
650	57.46	13.59	0.49
700	57.28	13.33	0.52
750	57.09	13.18	0.55
800	56.91	13.04	0.58
850	56.66	12.88	0.61
900	56.86	12.68	0.63
950	56.65	13.03	0.69
1000	56.42	13.06	0.73
1050	56.20	13.18	0.77
1100	55.94	13.22	0.81
1150	55.73	13.28	0.85
1200	55.50	13.30	0.89
1250	55.45	13.30	0.92
1300	55.33	13.57	0.98
1350	55.08	13.75	1.03
1400	54.74	13.86	1.08
1450	54.51	13.87	1.12
1500	54.38	13.90	1.16
1550	54.26	14.07	1.21
1600	53.99	14.20	1.26
1650	53.84	14.27	1.31
1700	53.66	14.37	1.36
1750	53.54	14.44	1.41
1800	**53.48**	14.62	**1.46**
1850	53.34	14.84	1.53
1900	**53.16**	15.05	**1.59**
1950	52.96	15.29	1.66
2000	52.68	15.49	1.72
2050	52.35	15.59	1.78
2100	52.10	15.62	1.83
2150	51.91	15.55	1.86
2200	51.97	15.59	1.91
2250	51.97	15.82	1.98
2300	51.86	16.17	2.07
2350	51.57	16.45	2.15
2400	51.29	16.63	2.22
2450	51.02	16.79	2.29
2500	50.80	16.91	2.35
2550	50.57	17.03	2.42
2600	50.36	17.15	2.48
2650	50.17	17.26	2.54
2700	49.99	17.39	2.61
2750	49.82	17.53	2.68
2800	49.61	17.71	2.76
2850	49.39	17.88	2.83
2900	49.12	18.02	2.91
2950	48.87	18.19	2.98
3000	48.62	18.22	3.04

P/N:	**SL AAM 180 CA**
Charge:	**061204_1-3**
Mea Date:	**20-Dez-06**
Temp (°C)	**22**

TARGET PARAMETERS		
f (MHz)	**eps**	**sigma**
1800	**53.3**	**1.52**
1900	**53.3**	**1.52**

Extrapolation/Interpolation: 1450 -2500 MHz range

5th polynomal parameters

	eps	sigma
x^5	-6.32E-14	-1.40E-15
x^4	6.19E-10	1.55E-11
x^3	-2.40E-06	-6.76E-08
x^2	4.60E-03	1.44E-04
x	-4.37E+00	-1.50E-01
const	1.70E+03	6.23E+01

GSM1800	eps	sigma
1710.2	54.0	1.36
1747.4	53.9	1.41
1784.8	53.8	1.45

AMPS1900	eps	sigma
1850.2	53.6	1.53
1880.0	53.4	1.57
1909.8	53.3	1.60

Sample Frequencies

f (MHz)	eps	sigma
1600	54.2	1.24
1640	54.1	1.28
1725	54.0	1.38
1750	53.9	1.41
1880	53.4	1.57

Difference to Target (%)

f (MHz)	**Δ-eps**	**Δ-sigma**
1800	0.3	-3.7
1900	-0.3	4.7

22.12.2006

MSL1950V2

f (MHz)	HP-e'	HP-e"	sigma
300	58.26	12.08	0.20
350	58.05	11.15	0.22
400	57.96	10.54	0.23
450	57.85	10.15	0.25
500	57.67	9.87	0.27
550	57.56	9.72	0.30
600	57.37	9.65	0.32
650	57.27	9.65	0.35
700	57.12	9.68	0.38
750	56.95	9.75	0.41
800	56.77	9.83	0.44
850	56.56	9.87	0.47
900	56.75	9.80	0.49
950	56.58	10.31	0.54
1000	56.36	10.51	0.58
1050	56.16	10.77	0.63
1100	55.86	10.94	0.67
1150	55.64	11.10	0.71
1200	55.40	11.19	0.75
1250	55.34	11.26	0.78
1300	55.24	11.60	0.84
1350	54.96	11.85	0.89
1400	54.66	12.03	0.94
1450	54.42	12.10	0.98
1500	54.34	12.19	1.02
1550	54.19	12.44	1.07
1600	53.96	12.62	1.12
1650	53.79	12.75	1.17
1700	53.63	12.89	1.22
1750	53.49	13.03	1.27
1800	53.44	13.23	1.33
1850	53.31	13.52	1.39
1900	53.10	13.78	1.46
1950	**52.92**	14.07	**1.53**
2000	**52.61**	14.31	**1.59**
2050	52.27	14.45	1.65
2100	51.98	14.52	1.70
2150	51.79	14.47	1.73
2200	51.83	14.53	1.78
2250	51.82	14.78	1.85
2300	51.69	15.14	1.94
2350	51.41	15.44	2.02
2400	51.12	15.64	2.09
2450	50.88	15.82	2.16
2500	50.62	15.96	2.22
2550	50.42	16.10	2.28
2600	50.17	16.25	2.35
2650	50.00	16.36	2.41
2700	49.81	16.52	2.48
2750	49.65	16.65	2.55
2800	49.44	16.87	2.63
2850	49.20	17.03	2.70
2900	48.95	17.23	2.78
2950	48.67	17.38	2.85
3000	48.44	17.46	2.91

P/N:	**SL AAM 195 BA**
Charge:	**061211_1-3**
Mea Date:	**20-Dez-06**
Temp (°C)	**22**

TARGET PARAMETERS

f (MHz)	eps	sigma
1950	**53.3**	**1.52**
2000	**53.3**	**1.52**

f (MHz)	e'	conductivity
1900	53.10	1.46
1950	**52.92**	**1.53**
2000	52.61	1.59

Difference to Target (%)

f (MHz)	Δ-eps	Δ-sigma
1950	-0.7	0.4
2000	-1.3	4.8

22.12.2006

Schmid & Partner Engineering AG

s p e a g

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 (MSL2450V2)**
Product No.	SL AAM 245 BA (Charge: 130502-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

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

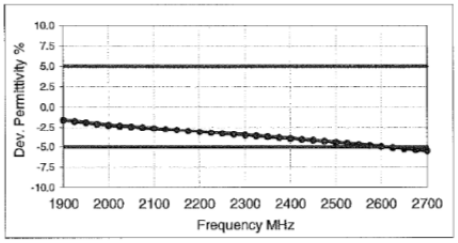
Test Condition

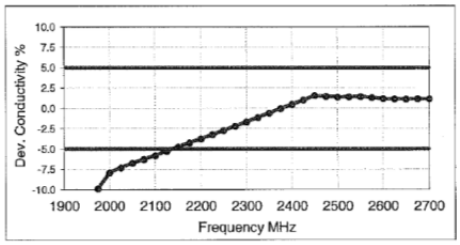
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	2-May-13
Operator	IEN

Additional Information

TSL Density	0.996 g/cm^3
TSL Heat-capacity	3.987 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
1900	52.5	12.14	1.28	53.3	1.52	-1.6	-15.6
1925	52.4	12.25	1.31	53.3	1.52	-1.7	-13.7
1950	52.3	12.35	1.34	53.3	1.52	-1.9	-11.8
1975	52.2	12.47	1.37	53.3	1.52	-2.1	-9.9
2000	52.1	12.59	1.40	53.3	1.52	-2.2	-7.9
2025	52.0	12.70	1.43	53.3	1.54	-2.3	-7.3
2050	52.0	12.82	1.46	53.2	1.57	-2.4	-6.7
2075	51.9	12.93	1.49	53.2	1.59	-2.5	-6.2
2100	51.8	13.03	1.52	53.2	1.62	-2.6	-5.8
2125	51.7	13.14	1.55	53.1	1.64	-2.7	-5.2
2150	51.6	13.25	1.58	53.1	1.66	-2.9	-4.7
2175	51.5	13.36	1.62	53.1	1.69	-3.0	-4.2
2200	51.4	13.46	1.65	53.0	1.71	-3.1	-3.7
2225	51.3	13.57	1.68	53.0	1.74	-3.2	-3.2
2250	51.2	13.67	1.71	53.0	1.76	-3.3	-2.7
2275	51.1	13.78	1.74	52.9	1.78	-3.4	-2.2
2300	**51.0**	**13.89**	**1.78**	**52.9**	**1.81**	**-3.5**	**-1.6**
2325	51.0	14.00	1.81	52.9	1.83	-3.6	-1.1
2350	50.9	14.11	1.84	52.8	1.85	-3.7	-0.6
2375	50.8	14.21	1.88	52.8	1.88	-3.8	0.0
2400	50.7	14.32	1.91	52.8	1.90	-3.9	0.5
2425	50.6	14.43	1.95	52.7	1.93	-4.1	1.1
2450	**50.5**	**14.53**	**1.98**	**52.7**	**1.95**	**-4.2**	**1.6**
2475	50.4	14.63	2.02	52.7	1.99	-4.3	1.5
2500	50.3	14.73	2.05	52.6	2.02	-4.4	1.4
2525	50.2	14.85	2.09	52.6	2.06	-4.5	1.4
2550	50.1	14.96	2.12	52.6	2.09	-4.7	1.5
2575	50.0	15.05	2.16	52.5	2.13	-4.8	1.3
2600	**49.9**	**15.13**	**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	49.7	15.33	2.26	52.4	2.23	-5.2	1.2
2675	49.6	15.43	2.30	52.4	2.27	-5.3	1.2
2700	49.5	15.52	2.33	52.4	2.30	-5.5	1.2





Schmid & Partner Engineering AG

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 (MBBL3500-5800V5)**
Product No.	SL AAM 501 EA (Charge: 130528-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 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-May-13
Operator	IEN

Additional Information

TSL Density
TSL Heat-capacity

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e"	sigma	eps	sigma	Δ-eps	Δ-sigma
3400	51.9	16.39	3.10	51.5	3.20	0.9	-3.0
3500	51.8	16.43	3.20	51.3	3.31	0.9	-3.4
3600	51.7	16.52	3.31	51.2	3.43	1.0	-3.5
3700	51.5	16.60	3.42	51.1	3.55	0.9	-3.6
3800	51.4	16.65	3.52	50.9	3.66	1.0	-3.9
3900	51.3	16.72	3.63	50.8	3.78	1.0	-4.0
4000	51.2	16.83	3.74	50.6	3.90	1.1	-4.0
4100	51.0	16.91	3.86	50.5	4.01	1.0	-3.9
4200	50.9	17.04	3.98	50.4	4.13	1.0	-3.7
4300	50.8	17.23	4.12	50.2	4.25	1.1	-3.0
4400	50.6	17.40	4.26	50.1	4.37	1.0	-2.4
4500	50.4	17.51	4.38	50.0	4.48	0.9	-2.3
4600	50.2	17.63	4.51	49.8	4.60	0.7	-1.9
4700	50.0	17.72	4.63	49.7	4.72	0.6	-1.8
4800	49.9	17.81	4.75	49.6	4.83	0.7	-1.7
4850	49.8	18.00	4.86	49.5	4.89	0.6	-0.6
4900	49.8	17.96	4.90	49.4	4.95	0.8	-1.0
4950	49.6	18.07	4.98	49.4	5.01	0.5	-0.5
5000	49.7	18.14	5.05	49.3	5.07	0.8	-0.3
5050	49.5	18.13	5.09	49.2	5.12	0.6	-0.7
5100	49.4	18.26	5.18	49.2	5.18	0.5	0.0
5150	49.3	18.26	5.23	49.1	5.24	0.4	-0.2
5200	49.2	18.38	5.32	49.0	5.30	0.4	0.4
5250	49.1	18.38	5.37	48.9	5.36	0.3	0.2
5300	49.0	18.50	5.45	48.9	5.42	0.2	0.6
5350	49.0	18.52	5.51	48.8	5.47	0.4	0.6
5400	48.8	18.58	5.58	48.7	5.53	0.1	0.9
5450	48.8	18.66	5.66	48.7	5.59	0.3	1.2
5500	48.7	18.64	5.70	48.6	5.65	0.2	0.9
5550	48.6	18.76	5.79	48.5	5.71	0.1	1.4
5600	48.6	18.76	5.85	48.5	5.77	0.3	1.4
5650	48.4	18.87	5.93	48.4	5.82	0.0	1.8
5700	48.4	18.89	5.99	48.3	5.88	0.1	1.8
5750	48.3	18.99	6.08	48.3	5.94	0.1	2.3
5800	48.2	19.01	6.13	48.2	6.00	0.0	2.2
5850	48.1	19.10	6.22	48.1	6.06	-0.1	2.7
5900	48.1	19.16	6.29	48.1	6.12	0.1	2.8