

Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HSL750V2)**
 Product No. SL AAH 075 AA (Batch: 170612-4)
 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 ($22 \pm 3^\circ\text{C}$ and humidity $< 70\%$).
 TSL Temperature 22°C
 Test Date 20-Jun-17
 Operator CL

Additional Information

TSL Density 1.284 g/cm^3
 TSL Heat-capacity $2.701 \text{ kJ/(kg}^\circ\text{K)}$

f [MHz]	Measured			Target		Diff.to Target [%]	
	e'	e''	sigma	eps	sigma	$\Delta\text{-eps}$	$\Delta\text{-sigma}$
600	45.6	22.97	0.77	42.7	0.88	6.7	-13.1
625	45.2	22.73	0.79	42.6	0.88	6.2	-10.6
650	44.9	22.49	0.81	42.5	0.89	5.6	-8.2
675	44.5	22.27	0.84	42.3	0.89	5.1	-5.8
700	44.2	22.05	0.86	42.2	0.89	4.6	-3.5
725	43.8	21.88	0.88	42.1	0.89	4.2	-1.0
750	43.5	21.72	0.91	41.9	0.89	3.8	1.4
775	43.2	21.55	0.93	41.8	0.90	3.4	3.7
800	42.9	21.38	0.95	41.7	0.90	2.9	6.0
825	42.6	21.24	0.97	41.6	0.91	2.4	7.5
838	42.5	21.17	0.99	41.5	0.91	2.2	8.2
850	42.3	21.09	1.00	41.5	0.92	2.0	8.9
875	42.0	20.98	1.02	41.5	0.94	1.2	8.3
900	41.7	20.87	1.05	41.5	0.97	0.5	7.7
925	41.5	20.76	1.07	41.5	0.98	0.0	8.7
950	41.2	20.64	1.09	41.4	0.99	-0.6	9.7
975	40.9	20.55	1.11	41.4	1.00	-1.1	10.9
1000	40.6	20.46	1.14	41.3	1.01	-1.7	12.1

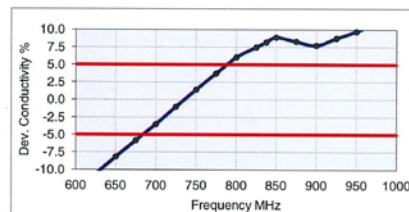
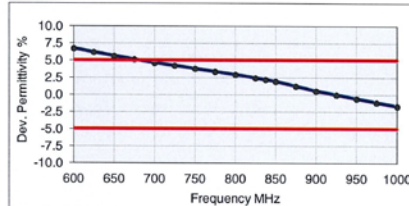


Figure D-3
750MHz Head Tissue Equivalent Matter

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3 Composition / Information on ingredients

The Item is composed of the following ingredients:

Water	50 – 73 %	
Non-ionic detergents	25 – 50 %	polyoxyethylenesorbitan monolaurate
NaCl	0 – 2 %	
Preservative	0.05 – 0.1 %	Preventol-D7

Safety relevant ingredients:

CAS-No. 55965-84-9	< 0.1 %	aqueous preparation, containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone
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CAS-No. 9005-64-5	< 50 %	polyoxyethylenesorbitan monolaurate
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According to international guidelines, the product is not a dangerous mixture and therefore not required to be marked by symbols.

Figure D-4
Composition of 2.4 GHz Head Tissue Equivalent Matter

Note: 2.4 GHz head 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.

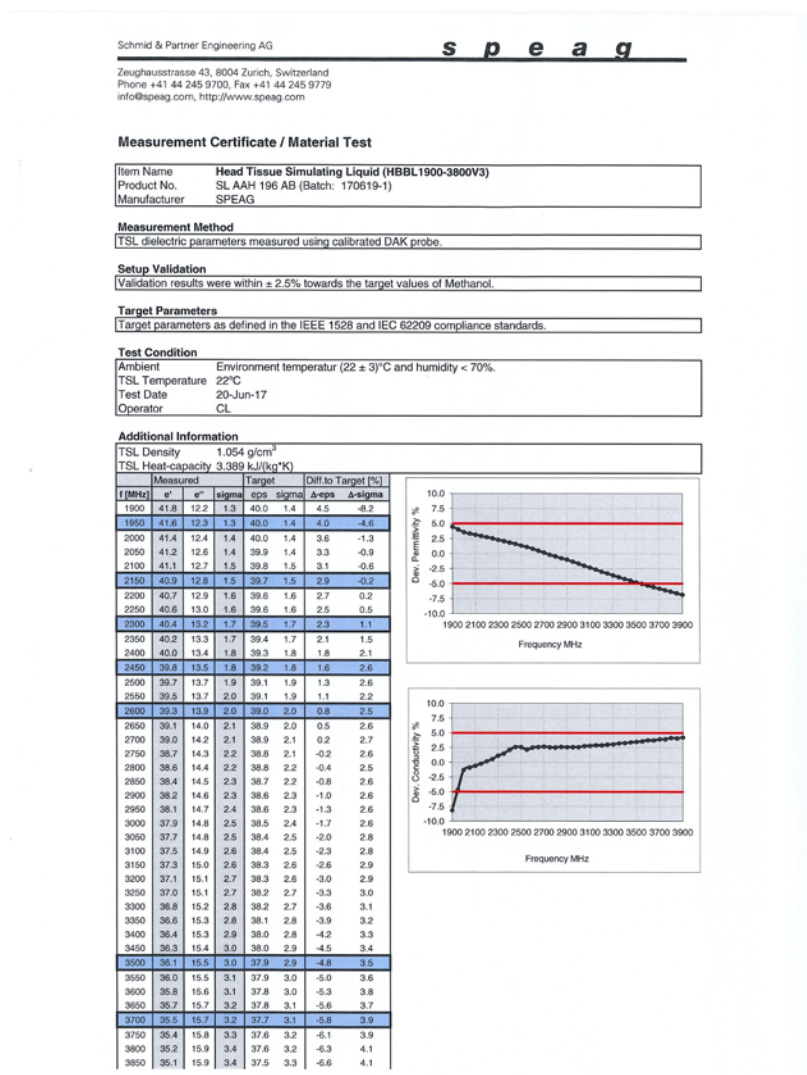


Figure D-5
2.4 GHz Head Tissue Equivalent Matter

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APPENDIX E: SAR SYSTEM VALIDATION

Per FCC KDB Publication 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

Table E-1
SAR System Validation Summary – 1g

SAR System	Freq. (MHz)	Date	Probe SN	Probe Cal Point		Cond. (σ)	Perm. (ϵ_r)	CW VALIDATION			MOD. VALIDATION		
								SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
H	750	9/5/2018	7409	750	Head	0.887	41.851	PASS	PASS	PASS	N/A	N/A	N/A
H	835	7/13/2018	7409	835	Head	0.932	43.227	PASS	PASS	PASS	GMSK	PASS	N/A
E	1750	2/6/2019	3589	1750	Head	1.363	41.67	PASS	PASS	PASS	N/A	N/A	N/A
E	1900	3/11/2019	3589	1900	Head	1.436	39.615	PASS	PASS	PASS	GMSK	PASS	N/A
D	1900	5/20/2019	3914	1900	Head	1.454	40.608	PASS	PASS	PASS	GMSK	PASS	N/A
E	2450	2/5/2019	3589	2450	Head	1.825	39.836	PASS	PASS	PASS	OFDM/TD D	PASS	PASS
I	750	5/16/2019	7357	750	Body	0.937	56.547	PASS	PASS	PASS	N/A	N/A	N/A
J	835	3/10/2019	7488	835	Body	0.988	53.868	PASS	PASS	PASS	GMSK	PASS	N/A
D	1750	4/29/2019	3914	1750	Body	1.529	51.886	PASS	PASS	PASS	N/A	N/A	N/A
G	1900	8/10/2018	7410	1900	Body	1.567	52.239	PASS	PASS	PASS	GMSK	PASS	N/A
L	2450	11/6/2018	7308	2450	Body	2.022	51.315	PASS	PASS	PASS	OFDM/TD D	PASS	PASS

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to FCC KDB Publication 865664 D01v01r04.

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APPENDIX G POWER REDUCTION VERIFICATION

Per the May 2017 TCBC Workshop Notes, demonstration of proper functioning of the power reduction mechanisms is required to support the corresponding SAR configurations. The verification process was divided into two parts: (1) evaluation of output power levels for individual or multiple triggering mechanisms and (2) evaluation of the triggering distances for proximity-based sensors.

G.1 Power Verification Procedure

The power verification was performed according to the following procedure:

1. A base station simulator was used to establish a conducted RF connection and the output power was monitored. The power measurements were confirmed to be within expected tolerances for all states before and after a power reduction mechanism was triggered.
2. Step 1 was repeated for all relevant modes and frequency bands for the mechanism being investigated.
3. Steps 1 and 2 were repeated for all individual power reduction mechanisms and combinations thereof. For the combination cases, one mechanism was switched to a 'triggered' state at a time; powers were confirmed to be within tolerances after each additional mechanism was activated.

G.2 WIFI Verification Summary

Table G-1
Power Measurement Verification WIFI

Mechanism(s)	Mode/Band	Conducted Power (dBm)	
1st		Un-triggered (Max)	Mechanism #1 (Reduced)
Held-to-Ear	802.11b	19.45	16.35
Held-to-Ear	802.11g	17.1	16.17

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