

Appendix B: Tissue Stimulating Liquids, System Checks and System Validation

B.1. SAR System Check

Prior to SAR assessment, the system is verified to $\pm 10\%$ of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. SAR System Validation was performed and complies with requirements per IEC/IEEE 62209-1528.

Table 1 System Check Results (SAR)

System	Frequency (MHz)	Tissue Type	Date	Amb. Temp. (°C)	Tissue Temp (°C)	Input Power (dBm)	Verification Source SN	Probe SN	DAE SN	Measured 1g SAR (W/Kg)	1W Target 1g SAR (W/Kg)	1W Normalized 1g SAR (W/Kg)	1g SAR Deviation	Measured 10g SAR (W/Kg)	1W Target 10g SAR (W/Kg)	1W Normalized 10g SAR (W/Kg)	10g SAR Deviation
Gamma	13	Head	05/22/2025	23.3	22.3	24.5	1041	7836	1839	0.123	0.457	0.436	-4.50%	0.076	0.296	0.270	-8.90%
Beta	2450	Head	05/19/2025	23.5	22.8	17	1112	7859	1862	2.580	50.600	51.478	1.73%	1.210	23.700	24.143	1.87%

B.2. Dielectric Parameters of the TSL

Table 2 SAR Tissue Dielectric Parameters

Date	Tissue Type	Liquid Temp (°C)	Frequency (MHz)	Conductivity Measured (σ)	Conductivity Target (σ)	Deviation	Permittivity measured (ϵ_r)	Permittivity Target (ϵ_r)	Deviation
5/19/2025	Head	22.8	2400	1.79	1.76	2.23%	37.5	39.3	-4.59%
5/19/2025	Head	22.8	2450	1.83	1.80	1.70%	37.4	39.2	-4.59%
5/19/2025	Head	22.8	2480	1.85	1.83	1.17%	37.3	39.2	-4.67%
5/19/2025	Head	22.8	2500	1.87	1.85	0.75%	37.3	39.1	-4.69%
5/22/2025	Head	22.3	12	0.69	0.75	-7.45%	50.2	55.0	-8.80%
5/22/2025	Head	22.3	13	0.69	0.75	-7.44%	50.4	55.0	-8.33%
5/22/2025	Head	22.3	14	0.69	0.75	-7.43%	50.5	55.0	-8.15%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

The SAR values were compensated for deviations between the measured and required tissue dielectric properties, as described in IEC/IEEE 62209-1528. The SAR values were applied to only scale up the measured SAR values, and not downward, per KDB Publication 865664 D01v04r04.

B.3. FCC System Validation

Per FCC KDB Publication 865664 D02 Section 2.3 a) states “SAR system validation status and system verification results should be documented in a separate section of the SAR report, or as an attachment, to confirm measurement accuracy.”

The SAR systems used for evaluating 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 D01 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.

Per FCC KDB 865664 D02, “the validation status should be documented according to the validation date(s), measurement frequencies, SAR probes, calibrated signal type(s) and tissue dielectric parameters.” A tabulated summary of the system validation status is provided accordingly:

Table 3 System Validation

System	Frequency (MHz)	Date	Probe	DAE	Probe CalF		Cond. (σ)	Perm (ϵ_r)	CW Validation			Mod Validation		
					Freq (MHz)	Tissue Type			Sensitivity	Probe Linearity	Probe Isotropy	Mod Type	Duty Factor	PAR
Gamma	13	11/26/2024	7836	1839	13	Head	0.703	54.138	PASS	PASS	PASS	TDD	PASS	N/A
Beta	2450	05/13/2025	7859	1862	2450	Head	1.72	38.4	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: The probes have been calibrated for both CW and modulated signals. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01 for scenarios when CW probe calibrations are used with other signal types.

SAR systems were additionally validated for modulated signals with a periodic duty cycle or with a high PAR (peak to average ratio) >5 dB, such as OFDM according to FCC KDB Publication 865664 D01 v01r04.

B.4. Sample TSL Compositions

TSL recipes are proprietary to SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer data sheets are provided below.

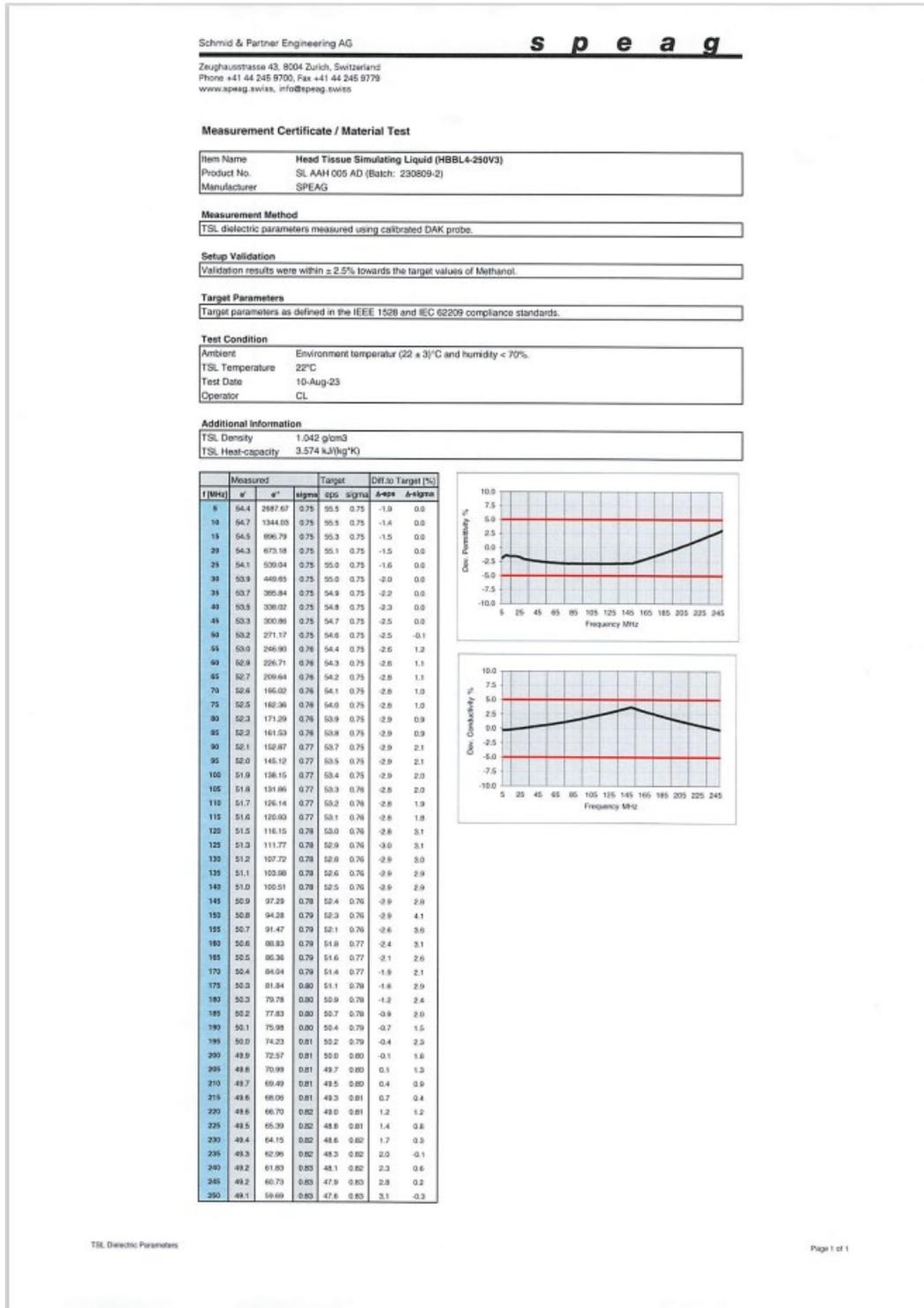


Figure 1 - Head TSL Calibration Certificate Example (4 – 250 MHz)

Measurement Certificate / Material Test

Item Name	Head Tissue Simulating Liquid (HBBL600-10000V6)
Product No.	SL AAH U16 BC (Batch: 230912-5)
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

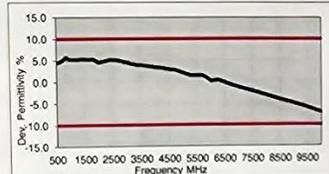
Ambient Condition 22°C ; 30% humidity
 TSL Temperature 22°C
 Test Date 14-Sep-23
 Operator CL

Additional Information

TSL Density
 TSL Heat-capacity

Results

f [MHz]	Measured			Target		Diff.to Target [%]	
	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
600	44.7	25.6	0.86	42.7	0.88	4.6	-2.5
750	44.2	21.7	0.90	41.9	0.89	5.4	0.7
900	44.0	20.7	0.92	41.7	0.90	5.6	2.5
825	44.0	20.3	0.93	41.6	0.91	5.8	2.6
835	44.0	20.1	0.94	41.5	0.91	5.9	3.1
850	43.9	19.9	0.94	41.5	0.92	5.8	2.6
900	43.8	19.2	0.96	41.5	0.97	5.5	-1.0
1400	42.8	15.2	1.18	40.6	1.18	5.4	0.0
1450	42.7	15.0	1.21	40.5	1.20	5.4	0.8
1600	42.4	14.4	1.29	40.3	1.28	5.2	0.4
1625	42.4	14.4	1.30	40.3	1.30	5.3	0.1
1640	42.4	14.3	1.31	40.3	1.31	5.3	0.3
1650	42.4	14.3	1.31	40.2	1.31	5.4	-0.2
1700	42.3	14.2	1.34	40.2	1.34	5.3	-0.2
1750	42.2	14.1	1.37	40.1	1.37	5.3	-0.1
1800	42.1	14.0	1.40	40.0	1.40	5.3	0.0
1810	42.1	13.9	1.41	40.0	1.40	5.3	0.7
1825	42.1	13.9	1.42	40.0	1.40	5.3	1.4
1850	42.1	13.9	1.43	40.0	1.40	5.3	2.1
1900	42.0	13.8	1.46	40.0	1.40	5.0	4.3
1950	41.9	13.7	1.49	40.0	1.40	4.7	6.4
2000	41.8	13.7	1.52	40.0	1.40	4.5	8.6
2050	41.8	13.6	1.55	39.9	1.44	4.7	7.3
2100	41.7	13.6	1.59	39.8	1.49	4.7	6.8
2150	41.6	13.6	1.62	39.7	1.53	4.7	5.7
2200	41.6	13.5	1.66	39.6	1.58	4.9	5.2
2250	41.5	13.5	1.69	39.6	1.62	4.9	4.2
2300	41.4	13.5	1.73	39.5	1.67	4.9	3.8
2350	41.4	13.5	1.77	39.4	1.71	5.1	3.4
2400	41.3	13.6	1.81	39.3	1.76	5.1	3.1
2450	41.2	13.6	1.85	39.2	1.80	5.1	2.8
2500	41.2	13.6	1.89	39.1	1.85	5.3	1.9
2550	41.1	13.6	1.93	39.1	1.91	5.2	1.1
2600	41.0	13.6	1.97	39.0	1.96	5.1	0.3



3500	39.4	14.1	2.75	37.9	2.91	3.9	-5.5
3700	39.1	14.3	2.94	37.7	3.12	3.7	-5.8
5200	36.6	16.0	4.62	36.0	4.66	1.7	-0.8
5250	36.5	16.1	4.69	35.9	4.71	1.6	-0.3
5300	36.4	16.2	4.78	35.9	4.76	1.5	0.1
5350	36.4	16.2	4.78	35.9	4.76	1.5	0.1
5400	36.4	16.2	4.78	35.9	4.76	1.5	0.1
5450	36.4	16.2	4.78	35.9	4.76	1.5	0.1
5500	36.2	16.4	5.03	35.6	4.96	1.5	1.3
5550	36.2	16.4	5.14	35.5	5.07	1.5	1.5
5600	36.1	16.5	5.14	35.5	5.07	1.5	1.5
5650	36.1	16.5	5.14	35.5	5.07	1.5	1.5
5700	35.9	16.5	5.25	35.4	5.17	1.2	1.4
5750	35.9	16.5	5.25	35.4	5.17	1.2	1.4
5800	35.7	16.6	5.34	35.3	5.27	1.2	1.4
5850	35.7	16.6	5.34	35.3	5.27	1.2	1.4
5900	35.7	16.6	5.34	35.3	5.27	1.2	1.4
5950	35.7	16.6	5.34	35.3	5.27	1.2	1.4
6000	35.1	16.5	5.52	35.1	5.48	0.2	0.9
6050	35.1	16.5	5.52	35.1	5.48	0.2	0.9
6100	35.1	16.5	5.52	35.1	5.48	0.2	0.9
6150	34.4	17.1	6.19	34.5	6.07	-0.1	1.9
6200	34.4	17.1	6.19	34.5	6.07	-0.1	1.9
6250	34.4	17.1	6.19	34.5	6.07	-0.1	1.9
6300	33.5	17.5	6.81	33.9	6.65	-1.3	2.4
6350	33.5	17.5	6.81	33.9	6.65	-1.3	2.4
6400	32.6	17.8	7.41	33.3	7.24	-2.1	2.4
6450	32.6	17.8	7.41	33.3	7.24	-2.1	2.4
6500	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6550	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6600	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6650	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6700	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6750	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6800	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6850	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6900	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
6950	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7000	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7050	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7100	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7150	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7200	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7250	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7300	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7350	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7400	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7450	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7500	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7550	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7600	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7650	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7700	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7750	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7800	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7850	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7900	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
7950	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8000	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8050	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8100	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8150	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8200	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8250	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8300	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8350	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8400	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8450	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8500	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8550	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8600	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8650	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8700	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8750	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8800	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8850	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8900	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8950	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9000	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9050	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9100	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9150	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9200	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9250	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9300	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9350	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9400	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9450	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9500	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9550	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9600	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9650	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9700	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9750	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9800	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9850	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9900	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
9950	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
10000	28.2	18.7	10.41	30.4	10.36	-7.0	0.5

TSL Dielectric Parameters

Figure 2 - Head TSL Calibration Certificate Example (600 – 10000 MHz)