

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. Full system validation status and result summary can be found in Section B.3.

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	Measured APD 4 cm ² (W/m ²)	1W target APD 4cm ² (W/m ²)	1W Normalized APD 4cm ² (W/m ²)	APD 4cm ² Deviation
Beta	2450	Head	6/10/2026	21.5	21.6	17	1112	7857	1838	2.740	50.600	54.670	8.04%	1.300	23.700	25.938	9.44%	N/A	N/A	N/A	N/A
Gamma	5250	Head	6/17/2026	24.5	24.0	17	1396	7872	1843	3.940	77.900	78.613	0.92%	1.130	22.400	22.546	0.65%	N/A	N/A	N/A	N/A

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
6/10/2026	Head	21.8	2300	1.73	1.67	4.04%	41.6	39.5	5.28%
6/10/2026	Head	21.8	2350	1.77	1.71	3.35%	41.5	39.4	5.38%
6/10/2026	Head	21.8	2400	1.81	1.76	3.05%	41.4	39.3	5.41%
6/10/2026	Head	21.8	2450	1.85	1.80	2.57%	41.3	39.2	5.44%
6/10/2026	Head	21.8	2500	1.89	1.85	1.79%	41.3	39.1	5.40%
6/10/2026	Head	21.8	2550	1.93	1.91	0.86%	41.2	39.1	5.34%
6/10/2026	Head	21.8	2600	1.97	1.96	0.26%	41.1	39.0	5.34%
6/10/2026	Head	21.8	2650	2.01	2.02	-0.48%	41.0	38.9	5.23%
6/10/2026	Head	21.8	2700	2.05	2.07	-1.01%	40.9	38.9	5.20%
6/17/2026	Head	23.9	5150	4.42	4.60	-3.90%	37.4	36.0	3.77%
6/17/2026	Head	23.9	5200	4.48	4.66	-3.77%	37.3	36.0	3.70%
6/17/2026	Head	23.9	5250	4.54	4.71	-3.61%	37.2	35.9	3.60%
6/17/2026	Head	23.9	5300	4.59	4.76	-3.51%	37.2	35.9	3.57%
6/17/2026	Head	23.9	5350	4.64	4.81	-3.42%	37.0	35.8	3.44%
6/17/2026	Head	23.9	5500	4.81	4.96	-3.15%	36.8	35.6	3.32%
6/17/2026	Head	23.9	5550	4.86	5.01	-3.00%	36.7	35.6	3.21%
6/17/2026	Head	23.9	5600	4.92	5.07	-2.84%	36.7	35.5	3.16%
6/17/2026	Head	23.9	5650	4.98	5.12	-2.63%	36.5	35.5	3.03%
6/17/2026	Head	23.9	5700	5.04	5.17	-2.48%	36.5	35.4	2.99%
6/17/2026	Head	23.9	5750	5.10	5.22	-2.33%	36.4	35.4	2.94%
6/17/2026	Head	23.9	5800	5.16	5.27	-2.15%	36.3	35.3	2.84%
6/17/2026	Head	23.9	5850	5.21	5.32	-2.08%	36.2	35.3	2.79%
6/17/2026	Head	23.9	5900	5.27	5.38	-1.97%	36.2	35.2	2.71%

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 IEEE 1528-2013. 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
Beta	2450	01/23/2026	7857	1838	2450	Head	1.77	38.7	PASS	PASS	PASS	OFDM	N/A	PASS
Gamma	5250	08/25/2025	7872	1843	5250	Head	4.53	34.7	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.

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

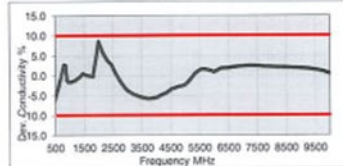
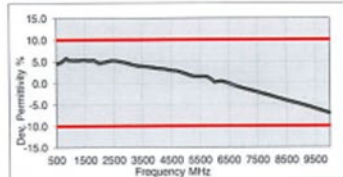
Ambient Condition 22°C ; 30% humidity
TSL Temperature 22°C
Test Date 14-Sep-23
Operator CL

Additional Information

TSL Density
TSL Heat-capacity

Results

f (MHz)	Measured			Target		Diff. to Target [%]	
	ϵ'	ϵ''	σ	ϵ_{ps}	σ_{ps}	$\Delta\epsilon_{ps}$	$\Delta\sigma_{ps}$
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
800	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	39.5	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	4.76	35.9	4.76	1.5	0.1
5500	36.2	16.4	5.03	35.6	4.96	1.5	1.3
5600	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	1.5	1.6
5800	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
6500	34.4	17.1	6.19	34.5	6.07	-0.1	1.9
7000	33.5	17.5	6.81	33.9	6.65	-1.3	2.4
7500	32.6	17.8	7.41	33.3	7.24	-2.1	2.4
8000	31.7	18.0	8.01	32.7	7.84	-3.1	2.2
8500	30.8	18.2	8.62	32.1	8.45	-4.1	2.0
9000	30.0	18.5	9.24	31.5	9.08	-4.9	1.9
9500	29.1	18.6	9.85	31.0	9.71	-5.9	1.4
10000	28.2	18.7	10.41	30.4	10.36	-7.0	0.5

Figure 1 - Head TSL Calibration Certificate Example (600 – 10000 MHz)