

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.4.

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
Delta	2450	Head	4/28/2026	23.0	22.4	17	1112	7853	1844	2.500	50.600	49.882	-1.42%	1.170	23.700	23.345	-1.50%	N/A	N/A	N/A	N/A
Gamma	2450	Head	5/12/2026	24.7	23.1	17	1112	7872	1843	2.630	50.600	52.475	3.71%	1.240	23.700	24.741	4.39%	N/A	N/A	N/A	N/A
Beta	2450	Head	5/28/2026	21.9	22.2	17	1112	7857	1838	2.560	50.600	51.079	0.95%	1.210	23.700	24.143	1.87%	N/A	N/A	N/A	N/A
Gamma	5250	Head	5/18/2026	21.9	22.0	17	1396	7872	1843	3.960	77.900	79.012	1.43%	1.130	22.400	22.546	0.65%	N/A	N/A	N/A	N/A
Beta	5250	Head	6/19/2026	24.3	22.1	17	1396	7857	1838	3.990	77.900	79.611	2.20%	1.140	22.400	22.746	1.54%	N/A	N/A	N/A	N/A
Gamma	5600	Head	5/18/2026	21.9	22.0	17	1396	7872	1843	4.120	81.100	82.205	1.36%	1.170	23.300	23.345	0.19%	N/A	N/A	N/A	N/A
Beta	5600	Head	6/19/2026	24.3	22.1	17	1396	7857	1838	4.170	81.100	83.202	2.59%	1.170	23.300	23.345	0.19%	N/A	N/A	N/A	N/A
Gamma	5750	Head	5/18/2026	21.9	22.0	17	1396	7872	1843	4.040	80.100	80.609	0.63%	1.150	22.800	22.946	0.64%	N/A	N/A	N/A	N/A
Beta	5750	Head	6/19/2026	24.3	22.1	17	1396	7857	1838	3.990	80.100	79.611	-0.61%	1.130	22.800	22.546	-1.11%	N/A	N/A	N/A	N/A
Gamma	5850	Head	5/18/2026	21.9	22.0	17	1396	7872	1843	4.080	76.900	81.407	5.86%	1.160	22.000	23.145	5.20%	N/A	N/A	N/A	N/A
Beta	5850	Head	6/19/2026	24.3	22.1	17	1396	7857	1838	4.040	76.900	80.609	4.82%	1.140	22.000	22.746	3.39%	N/A	N/A	N/A	N/A
Gamma	6500	Head	5/6/2026	23.7	23.3	10	1104	7872	1843	2.850	298.000	285.000	-4.36%	0.537	55.000	53.700	-2.36%	13.000	1340.000	1300.000	-2.99%
Gamma	6500	Head	6/20/2026	24.1	21.6	10	1104	7872	1843	2.900	298.000	290.000	-2.68%	0.538	55.000	53.800	-2.18%	13.000	1340.000	1300.000	-2.99%

B.2. Power Density System Check

The system was verified to be within ± 0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources.

The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.

Table 2 System Check Results (Power Density)

Date	Probe SN	Frequency (MHz)	Source SN	Prad (mW)	Measured Normal psPD (W/m ²)	Target Normal psPD (W/m ²)	Deviation Normal psPD (dB)	Measured Total psPD (W/m ²)	Target Total psPD (W/m ²)	Deviation Total psPD (dB)
5/6/2026	9690	10000.0	1074	1.46	0.872	0.838	0.17	0.874	0.842	0.16

B.3. Dielectric Parameters of the TSL

Table 3 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
4/28/2026	Head	22.9	2300	1.71	1.67	2.58%	40.7	39.5	3.24%
4/28/2026	Head	22.9	2350	1.74	1.71	1.91%	40.7	39.4	3.34%
4/28/2026	Head	22.9	2400	1.78	1.76	1.58%	40.6	39.3	3.41%
4/28/2026	Head	22.9	2450	1.82	1.80	1.18%	40.6	39.2	3.49%
4/28/2026	Head	22.9	2500	1.86	1.85	0.46%	40.5	39.1	3.45%
4/28/2026	Head	22.9	2550	1.90	1.91	-0.34%	40.4	39.1	3.38%
4/28/2026	Head	22.9	2600	1.95	1.96	-0.90%	40.3	39.0	3.39%
4/28/2026	Head	22.9	2650	1.99	2.02	-1.59%	40.2	38.9	3.25%
4/28/2026	Head	22.9	2700	2.03	2.07	-2.14%	40.1	38.9	3.24%
4/30/2026	Head	24	5150	4.45	4.60	-3.34%	37.5	36.0	3.91%
4/30/2026	Head	24	5200	4.51	4.66	-3.19%	37.4	36.0	3.80%
4/30/2026	Head	24	5250	4.56	4.71	-3.00%	37.3	35.9	3.71%
4/30/2026	Head	24	5300	4.62	4.76	-2.92%	37.2	35.9	3.64%
4/30/2026	Head	24	5350	4.67	4.81	-2.83%	37.1	35.8	3.52%
4/30/2026	Head	24	5500	4.84	4.96	-2.54%	36.8	35.6	3.34%
4/30/2026	Head	24	5550	4.89	5.01	-2.38%	36.7	35.6	3.24%
4/30/2026	Head	24	5600	4.96	5.07	-2.15%	36.7	35.5	3.17%
4/30/2026	Head	24	5650	5.01	5.12	-1.98%	36.5	35.5	3.04%
4/30/2026	Head	24	5700	5.06	5.17	-1.78%	36.5	35.4	2.98%
4/30/2026	Head	24	5750	5.13	5.22	-1.71%	36.4	35.4	2.92%
4/30/2026	Head	24	5800	5.19	5.27	-1.44%	36.3	35.3	2.81%
4/30/2026	Head	24	5850	5.24	5.32	-1.47%	36.2	35.3	2.74%
4/30/2026	Head	24	5900	5.31	5.38	-1.22%	36.1	35.2	2.65%
5/6/2026	Head	23.5	5910	5.22	5.39	-3.03%	35.6	35.2	1.10%
5/6/2026	Head	23.5	5950	5.27	5.43	-2.87%	35.5	35.2	1.03%
5/6/2026	Head	23.5	6000	5.32	5.48	-2.85%	35.4	35.1	0.98%
5/6/2026	Head	23.5	6050	5.39	5.54	-2.72%	35.3	35.0	0.86%
5/6/2026	Head	23.5	6100	5.45	5.60	-2.73%	35.3	35.0	0.81%
5/6/2026	Head	23.5	6150	5.51	5.66	-2.55%	35.2	34.9	0.74%
5/6/2026	Head	23.5	6200	5.56	5.72	-2.65%	35.1	34.9	0.66%
5/6/2026	Head	23.5	6250	5.63	5.78	-2.51%	35.0	34.8	0.61%
5/6/2026	Head	23.5	6500	5.92	6.07	-2.48%	34.6	34.5	0.29%
5/6/2026	Head	23.5	6750	6.21	6.36	-2.29%	34.2	34.2	-0.12%
5/6/2026	Head	23.5	7000	6.50	6.65	-2.31%	33.9	33.9	-0.15%
5/6/2026	Head	23.5	7250	6.83	6.95	-1.66%	33.4	33.6	-0.73%
5/6/2026	Head	23.5	7950	7.67	7.78	-1.39%	32.3	32.8	-1.32%
5/6/2026	Head	23.5	8000	7.72	7.84	-1.52%	32.3	32.7	-1.36%
5/12/2026	Head	23.1	2300	1.65	1.67	-1.10%	40.1	39.5	1.63%
5/12/2026	Head	23.1	2300	1.65	1.67	-1.10%	40.1	39.5	1.63%
5/12/2026	Head	23.1	2350	1.68	1.71	-1.67%	40.1	39.4	1.74%
5/12/2026	Head	23.1	2350	1.68	1.71	-1.67%	40.1	39.4	1.74%
5/12/2026	Head	23.1	2400	1.72	1.76	-1.95%	40.0	39.3	1.78%
5/12/2026	Head	23.1	2400	1.72	1.76	-1.95%	40.0	39.3	1.78%
5/12/2026	Head	23.1	2450	1.76	1.80	-2.38%	39.9	39.2	1.85%
5/12/2026	Head	23.1	2450	1.76	1.80	-2.38%	39.9	39.2	1.85%
5/12/2026	Head	23.1	2500	1.80	1.85	-3.11%	39.8	39.1	1.81%
5/12/2026	Head	23.1	2500	1.80	1.85	-3.11%	39.8	39.1	1.81%
5/12/2026	Head	23.1	2550	1.83	1.91	-3.92%	39.8	39.1	1.76%
5/12/2026	Head	23.1	2550	1.83	1.91	-3.92%	39.8	39.1	1.76%
5/12/2026	Head	23.1	2600	1.88	1.96	-4.47%	39.7	39.0	1.76%
5/12/2026	Head	23.1	2600	1.88	1.96	-4.47%	39.7	39.0	1.76%
5/12/2026	Head	23.1	2650	1.91	2.02	-5.19%	39.6	38.9	1.66%
5/12/2026	Head	23.1	2650	1.91	2.02	-5.19%	39.6	38.9	1.66%
5/12/2026	Head	23.1	2700	1.95	2.07	-5.78%	39.5	38.9	1.62%
5/12/2026	Head	23.1	2700	1.95	2.07	-5.78%	39.5	38.9	1.62%
5/28/2026	Head	22.7	2300	1.68	1.67	0.84%	39.8	39.5	0.94%
5/28/2026	Head	22.7	2350	1.71	1.71	0.21%	39.8	39.4	1.02%
5/28/2026	Head	22.7	2400	1.75	1.76	-0.08%	39.7	39.3	1.07%
5/28/2026	Head	22.7	2450	1.79	1.80	-0.54%	39.6	39.2	1.11%
5/28/2026	Head	22.7	2500	1.83	1.85	-1.33%	39.6	39.1	1.06%
5/28/2026	Head	22.7	2550	1.87	1.91	-2.23%	39.5	39.1	1.01%
5/28/2026	Head	22.7	2600	1.91	1.96	-2.80%	39.4	39.0	1.03%
5/28/2026	Head	22.7	2650	1.95	2.02	-3.52%	39.3	38.9	0.94%
5/28/2026	Head	22.7	2700	1.99	2.07	-4.02%	39.2	38.9	0.91%
6/19/2026	Head	22.1	5150	4.37	4.60	-5.10%	36.8	36.0	2.01%
6/19/2026	Head	22.1	5200	4.42	4.66	-5.02%	36.7	36.0	1.93%
6/19/2026	Head	22.1	5250	4.48	4.71	-4.82%	36.6	35.9	1.82%
6/19/2026	Head	22.1	5300	4.53	4.76	-4.81%	36.5	35.9	1.78%
6/19/2026	Head	22.1	5350	4.58	4.81	-4.75%	36.4	35.8	1.66%
6/19/2026	Head	22.1	5500	4.74	4.96	-4.57%	36.2	35.6	1.52%
6/19/2026	Head	22.1	5550	4.79	5.01	-4.46%	36.1	35.6	1.41%
6/19/2026	Head	22.1	5600	4.85	5.07	-4.27%	36.0	35.5	1.36%
6/19/2026	Head	22.1	5650	4.90	5.12	-4.15%	35.9	35.5	1.22%
6/19/2026	Head	22.1	5700	4.96	5.17	-3.96%	35.8	35.4	1.17%
6/19/2026	Head	22.1	5750	5.01	5.22	-3.96%	35.8	35.4	1.12%
6/19/2026	Head	22.1	5800	5.07	5.27	-3.70%	35.7	35.3	1.02%
6/19/2026	Head	22.1	5850	5.12	5.32	-3.75%	35.6	35.3	0.95%
6/19/2026	Head	22.1	5900	5.18	5.36	-3.54%	35.5	35.2	0.87%
6/20/2026	Head	21.9	5910	5.20	5.39	-1.12%	36.4	35.2	2.37%
6/20/2026	Head	21.9	5950	5.37	5.43	-1.07%	36.3	35.2	2.28%
6/20/2026	Head	21.9	6000	5.43	5.48	-0.95%	36.2	35.1	2.26%
6/20/2026	Head	21.9	6050	5.49	5.54	-0.96%	36.1	35.0	3.13%
6/20/2026	Head	21.9	6100	5.55	5.60	-0.89%	36.1	35.0	3.10%
6/20/2026	Head	21.9	6150	5.61	5.66	-0.81%	36.0	34.9	3.00%
6/20/2026	Head	21.9	6200	5.67	5.72	-0.82%	35.9	34.9	2.94%
6/20/2026	Head	21.9	6250	5.73	5.78	-0.73%	35.8	34.8	2.86%
6/20/2026	Head	21.9	6500	6.03	6.07	-0.71%	35.4	34.5	2.62%
6/20/2026	Head	21.9	6750	6.34	6.36	-0.38%	35.0	34.2	2.25%
6/20/2026	Head	21.9	7000	6.62	6.65	-0.44%	34.6	33.9	2.21%
6/20/2026	Head	21.9	7250	6.95	6.95	0.07%	34.2	33.6	1.69%
6/20/2026	Head	21.9	7850	7.82	7.78	0.47%	33.1	32.8	0.95%
6/20/2026	Head	21.9	8000	7.87	7.84	0.32%	33.0	32.7	1.01%

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.4. 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 4 System Validation

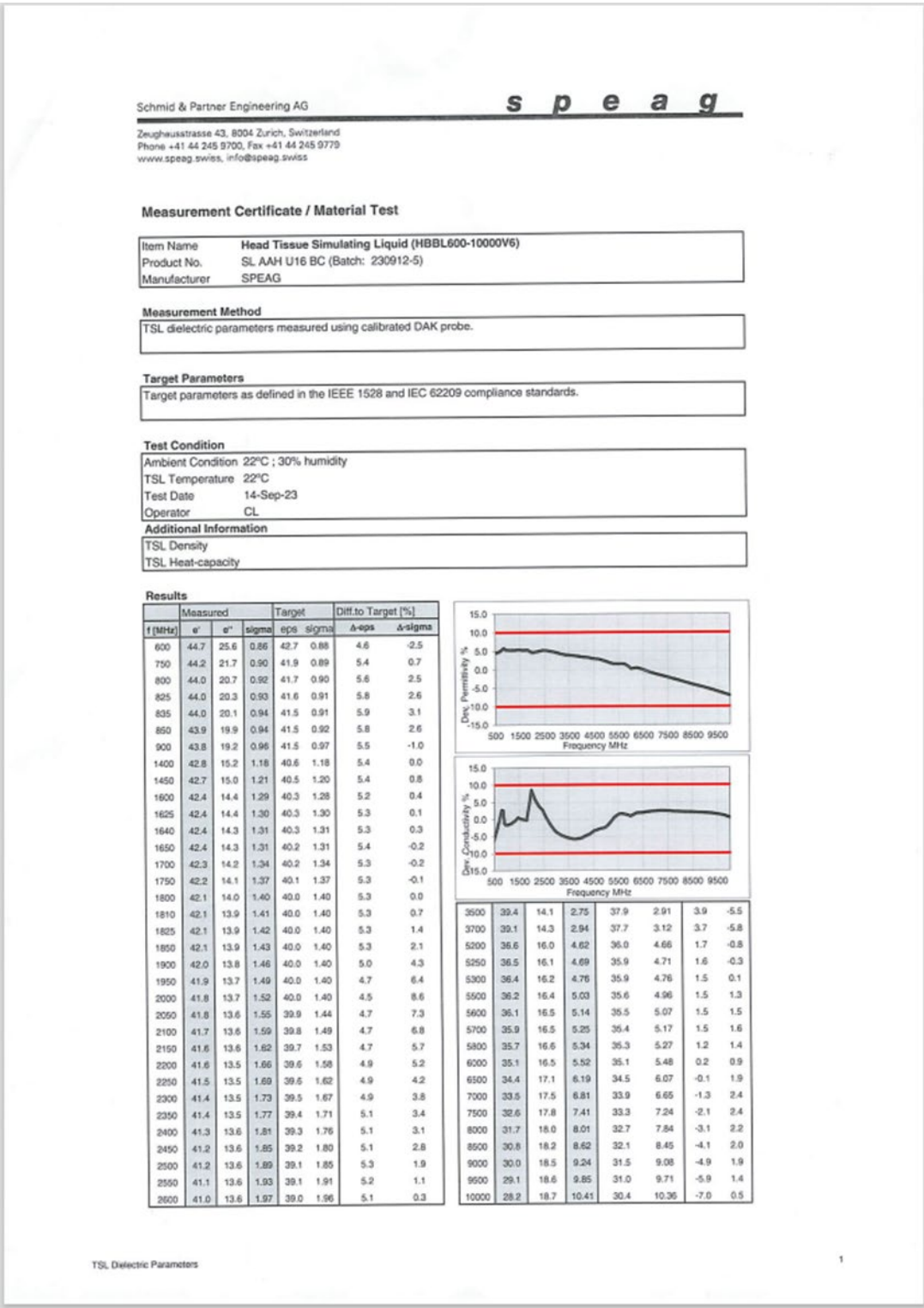
System	Frequency (MHz)	Date	Probe	DAE	Probe CalF		Cond. (σ)	Perm (ϵ_r)	CW Validation			Mod Validation		
					Freq (MHz)	Tissue Type			Sensitivity	Probe Linearity	Probe Isotropy	Mod Type	Duty Factor	PAR
Delta	2450	12/11/2025	7853	1844	2450	Head	1.8	39.9	PASS	PASS	PASS	OFDM	N/A	PASS
Gamma	2450	08/22/2025	7872	1843	2450	Head	1.824	39.432	PASS	PASS	PASS	OFDM	N/A	PASS
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
Beta	5250	01/28/2026	7857	1838	5250	Head	4.6	35.2	PASS	PASS	PASS	OFDM	N/A	PASS
Gamma	5600	08/26/2025	7872	1843	5600	Head	4.971	33.989	PASS	PASS	PASS	OFDM	N/A	PASS
Beta	5600	01/29/2026	7857	1838	5600	Head	4.97	34.5	PASS	PASS	PASS	OFDM	N/A	PASS
Gamma	5750	08/26/2025	7872	1843	5750	Head	5.141	33.717	PASS	PASS	PASS	OFDM	N/A	PASS
Beta	5750	01/29/2026	7857	1838	5750	Head	5.16	34.2	PASS	PASS	PASS	OFDM	N/A	PASS
Gamma	5850	08/26/2025	7872	1843	5850	Head	5.2	33.6	PASS	PASS	PASS	OFDM	N/A	PASS
Beta	5850	01/29/2026	7857	1838	5850	Head	5.26	34	PASS	PASS	PASS	OFDM	N/A	PASS
Gamma	6500	09/19/2025	7872	1843	6500	Head	5.99	32.2	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.5. 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.



Results

f (MHz)	Measured			Target		Diff. to Target [%]	
	ϵ'	ϵ''	σ	ϵ'	σ	$\Delta\epsilon'$	$\Delta\sigma$
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
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	39.6	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

Dielectric Parameters

Permittivity ϵ'

Conductivity σ

3500

3700

5200

5250

5300

5500

5600

5700

5800

6000

6500

7000

7500

8000

8500

9000

9500

10000

39.4

39.1

36.6

36.5

36.4

36.2

36.1

35.9

35.7

35.1

34.4

33.5

32.6

31.7

30.8

30.0

29.1

28.2

14.1

14.3

16.0

16.1

16.2

16.4

16.5

16.5

16.6

16.5

17.1

17.5

17.8

18.0

18.2

18.5

18.6

18.7

2.75

2.94

4.62

4.69

4.76

5.03

5.14

5.25

5.34

5.52

6.19

6.81

7.41

8.01

8.62

9.24

9.85

10.41

37.9

37.7

36.0

35.9

35.9

35.6

35.5

36.4

36.3

35.1

34.5

33.9

33.3

32.7

32.1

31.5

31.0

30.4

2.91

3.12

4.66

4.71

4.76

4.96

5.07

5.17

5.27

5.48

6.07

6.65

7.24

7.84

8.45

9.08

9.71

10.36

3.9

3.7

1.7

1.6

1.5

1.5

1.5

1.5

1.2

0.2

-0.1

-1.3

-2.1

-3.1

-4.1

-4.9

-5.9

-7.6

-5.5

-5.8

-0.8

-0.3

0.1

1.3

1.5

1.6

1.4

0.9

1.9

2.4

2.4

2.2

2.0

1.9

1.4

0.5

TSL Dielectric Parameters

1

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