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CALIBRATION LABORATORY

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 3900MHz

Impedance, transformed to feed point	46.3Ω- 5.34jΩ
Return Loss	- 23.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.008 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 2023-09-26

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 3900 MHz; Type: D3900V2; Serial: D3900V2 - SN: 1058

Communication System: UID 0, CW; Frequency: 3900 MHz

Medium parameters used: f = 3900 MHz; σ = 3.309 S/m; ε_r = 36.8; ρ = 1000 kg/m^3

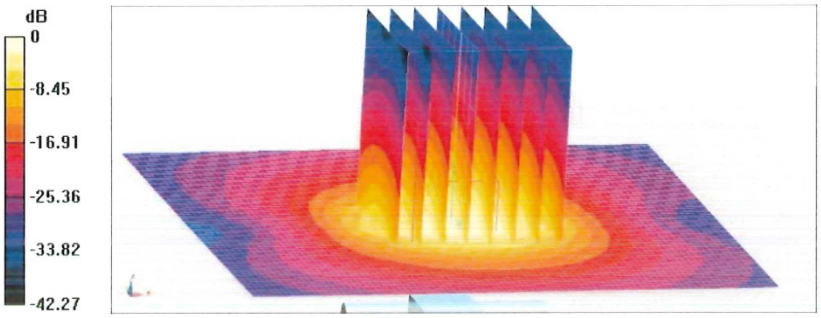
Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(6.76, 6.76, 6.76) @ 3900 MHz; Calibrated: 2023-03-31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=3900 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.56 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 19.8 W/kg
SAR(1 g) = 6.88 W/kg; SAR(10 g) = 2.41 W/kg
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 73.3%
Maximum value of SAR (measured) = 13.2 W/kg



0 dB = 13.2 W/kg = 11.21 dBW/kg

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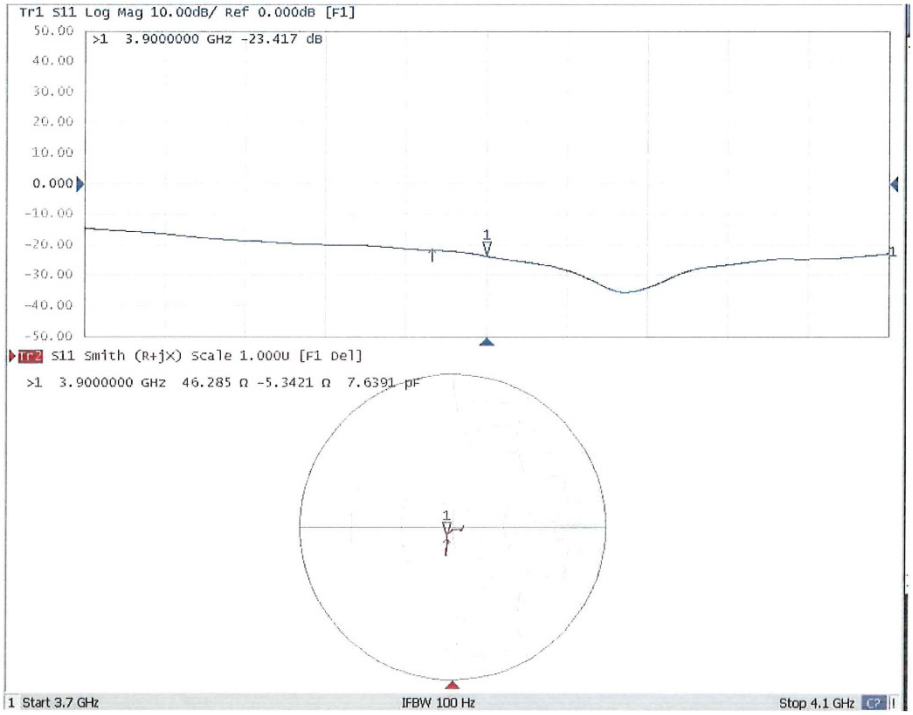
Impedance Measurement Plot for Head TSL



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APPENDIX D RETURN LOSS&IMPEDANCE MEASUREMENT

Equipment Details:

Description:	Dipole
Manufacturer:	Speag
Model Number:	D750V3
Serial Number:	1229
Calibration Date:	2024/03/26
Calibrated By:	Bob Lu
Signature:	Bob Lu

All Calibration have been conducted in the closed laboratory facility: Lab Temperature 18℃-25℃ and humidity < 70%

The calibration methods and procedures used were as detailed in:

KDB Publication Number: "KDB865664 D01 SAR Measurement 100 MHz to 6 GHz"

1. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
2. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

Calibrated Equipment:

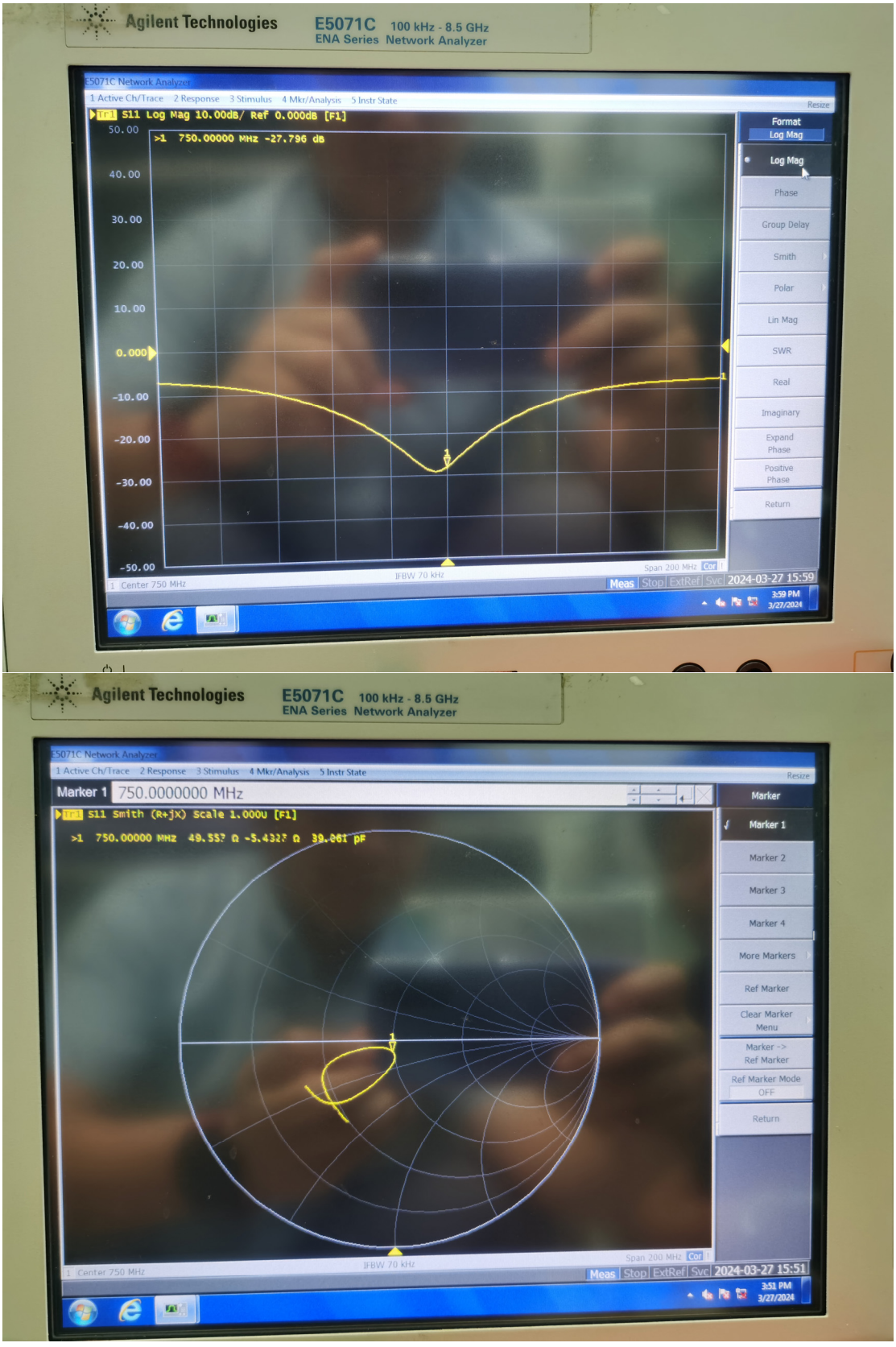
Equipment	Model	S/N	Calibration Date	Calibration Due Date
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2023/06/08	2024/06/07
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR

Test Data:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
750	Head	Return Loss	27.796 dB	29.503 dB	-5.786%	±20%; ≥20dB	Pass
		Real Impedance	49.557 Ω	53.314 Ω	3.757 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-5.432 Ω	-0.992 Ω	4.44 Ω	≤ 5 Ω	Pass

Note: Return Loss Deviation = (Measured-Target)/Target×100%

Dipole, 750MHz, 1229



Equipment Details:

Description:	Dipole
Manufacturer:	Speag
Model Number:	D1750V2
Serial Number:	1199
Calibration Date:	2024/03/26
Calibrated By:	Bob Lu
Signature:	Bob Lu

All Calibration have been conducted in the closed laboratory facility: Lab Temperature 18℃-25℃ and humidity < 70%

The calibration methods and procedures used were as detailed in:

KDB Publication Number: "KDB865664 D01 SAR Measurement 100 MHz to 6 GHz"

3. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
4. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

Calibrated Equipment:

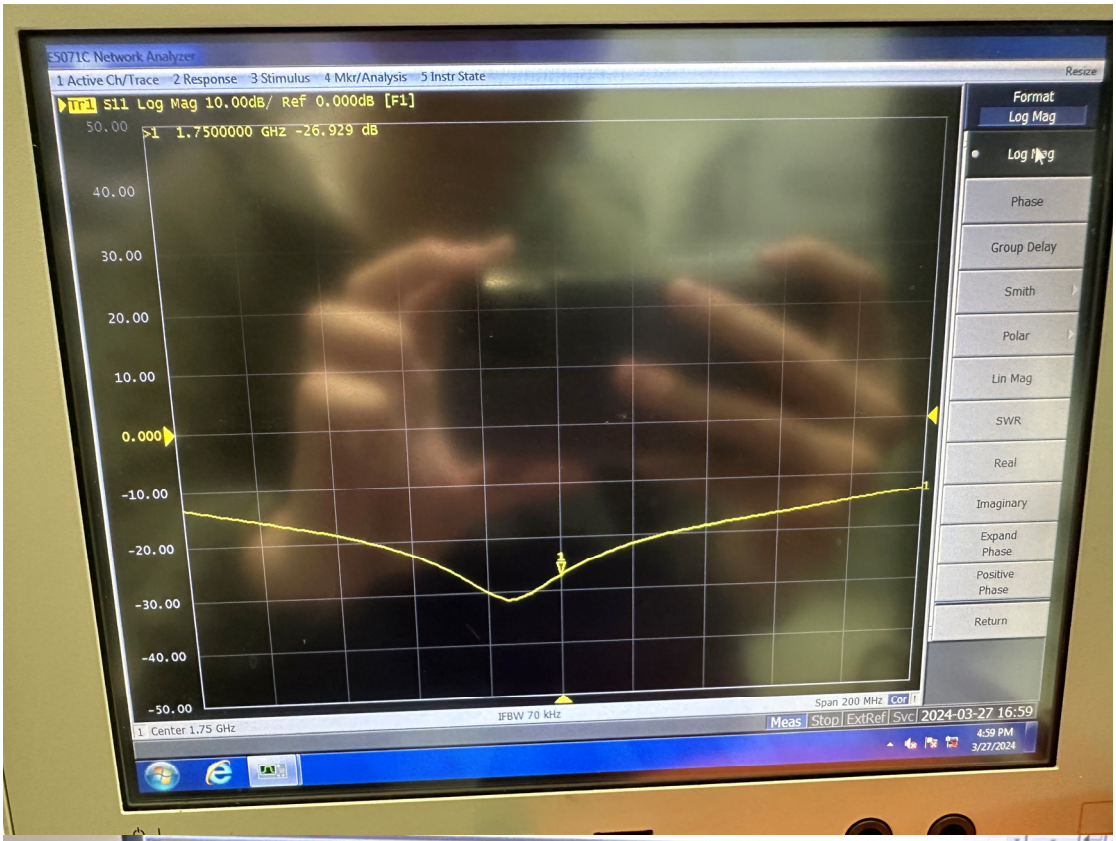
Equipment	Model	S/N	Calibration Date	Calibration Due Date
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2023/06/08	2024/06/07
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR

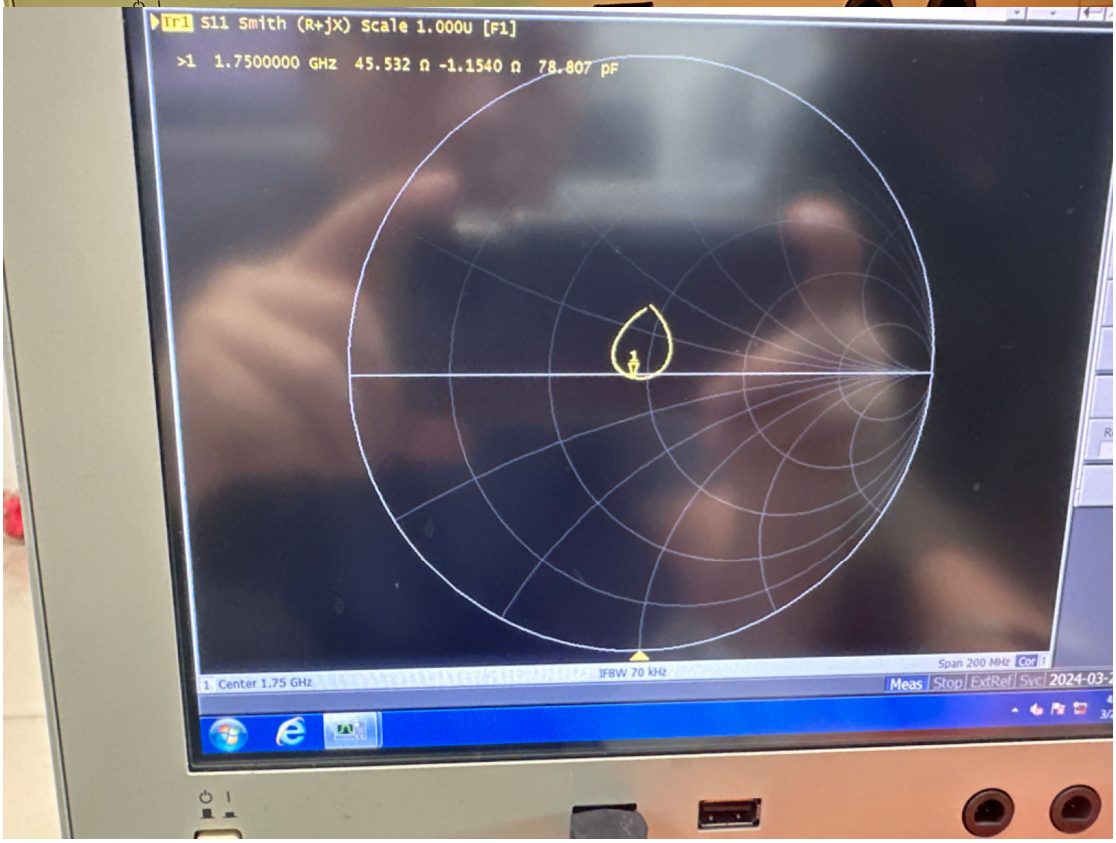
Test Data:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
1750	Head	Return Loss	26.929 dB	26.017 dB	3.505%	±20%; ≥20dB	Pass
		Real Impedance	45.532 Ω	46.939 Ω	1.407 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-1.154 Ω	3.765 Ω	4.919 Ω	≤ 5 Ω	Pass

Note: Return Loss Deviation = (Measured-Target)/Target×100%

Dipole, 1750MHz, 1199





Equipment Details:

Description:	Dipole
Manufacturer:	Speag
Model Number:	D2450V2
Serial Number:	1103
Calibration Date:	2024/03/26
Calibrated By:	Bob Lu
Signature:	Bob Lu

All Calibration have been conducted in the closed laboratory facility: Lab Temperature 18℃-25℃ and humidity < 70%

The calibration methods and procedures used were as detailed in:

KDB Publication Number: "KDB865664 D01 SAR Measurement 100 MHz to 6 GHz"

5. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
6. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

Calibrated Equipment:

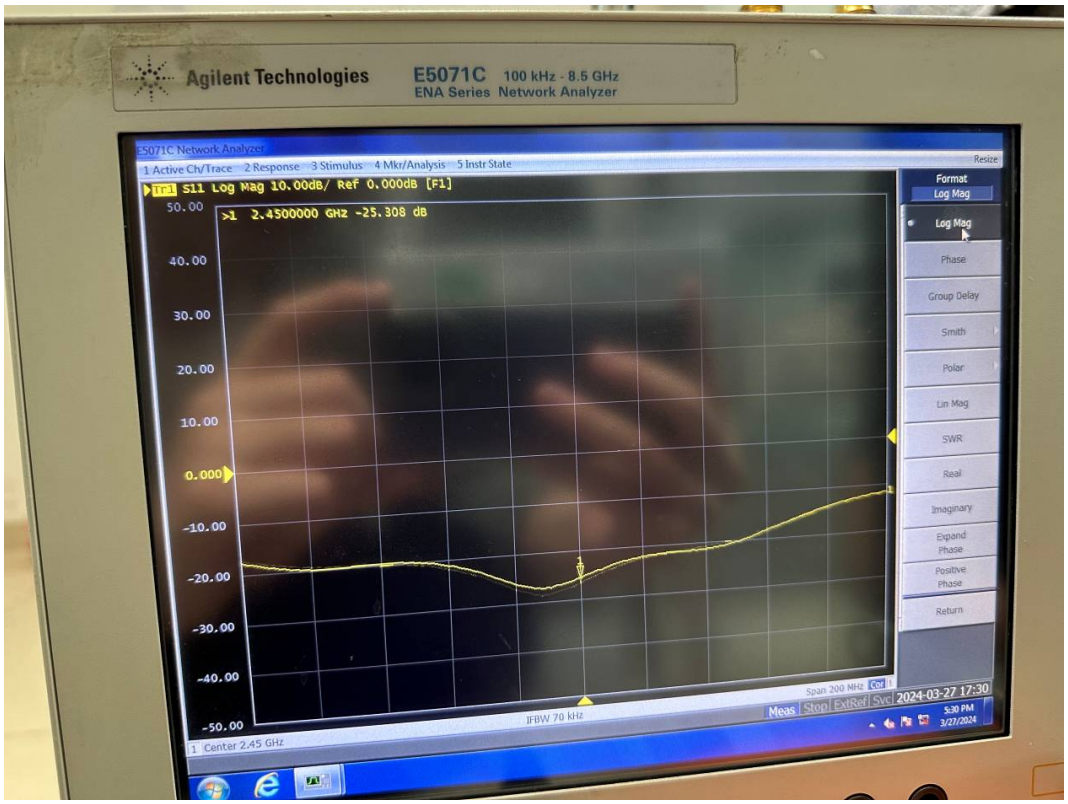
Equipment	Model	S/N	Calibration Date	Calibration Due Date
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2023/06/08	2024/06/07
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR

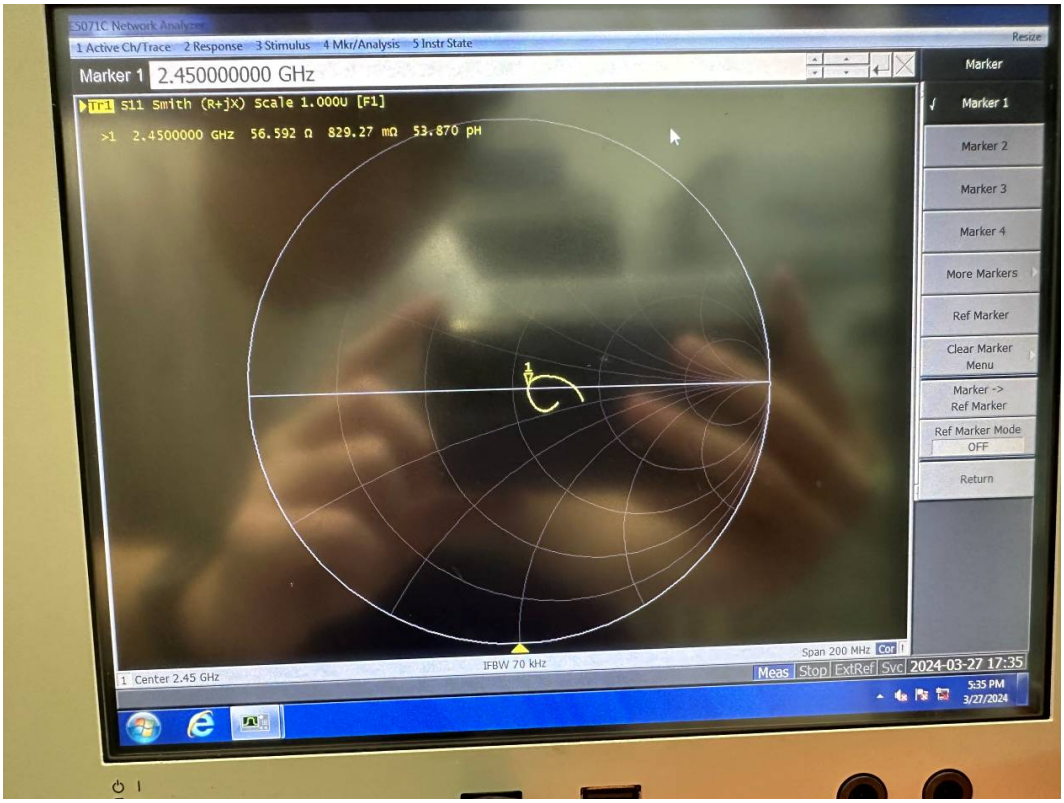
Test Data:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
2450	Head	Return Loss	25.308 dB	24.161 dB	4.747 %	±20%; ≥20dB	Pass
		Real Impedance	56.592 Ω	53.467 Ω	3.125 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	0.829 Ω	5.400 Ω	-4.571 Ω	≤ 5 Ω	Pass

Note: Return Loss Deviation = (Measured-Target)/Target×100%

Dipole, 2450MHz, 1103





Equipment Details:

Description:	Dipole
Manufacturer:	Speag
Model Number:	D2600V2
Serial Number:	1207
Calibration Date:	2024/03/26
Calibrated By:	Bob Lu
Signature:	Bob Lu

All Calibration have been conducted in the closed laboratory facility: Lab Temperature 18℃-25℃ and humidity < 70%

The calibration methods and proc30.9edures used were as detailed in:

KDB Publication Number: "KDB865664 D01 SAR Measurement 100 MHz to 6 GHz"

7. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
8. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

Calibrated Equipment:

Equipment	Model	S/N	Calibration Date	Calibration Due Date
Simulated Tissue Liquid Head	HBBL600-10000V6	2200808-2	Each Time	
SAM Twin Phantom	SAM-Twin V8.0	1962	NCR	NCR
Network Analyzer	E5071C	SER MY46519680	2023/06/08	2024/06/07
Network Analyzer Calibration Kit	50 Ω	51026	NCR	NCR

Test Data:

Frequency (MHz)	Simulated Liquid	Parameter	Measured Value	Target Value	Deviation	Reference Range	Results
2600	Head	Return Loss	30.923 dB	27.361 dB	13.019%	±20%; ≥20dB	Pass
		Real Impedance	48.396 Ω	45.943 Ω	2.453 Ω	≤ 5 Ω	Pass
		Imaginary Impedance	-0.109 Ω	-0.667 Ω	0.558 Ω	≤ 5 Ω	Pass

Note: Return Loss Deviation = (Measured-Target)/Target×100%

Dipole, 2600MHz, 1207