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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;  $\sigma = 3.309$  S/m;  $\epsilon_r = 36.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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

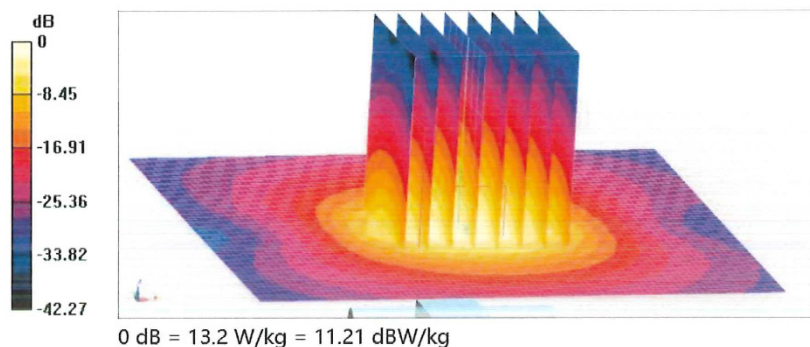
Peak SAR (extrapolated) = 19.8 W/kg

**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





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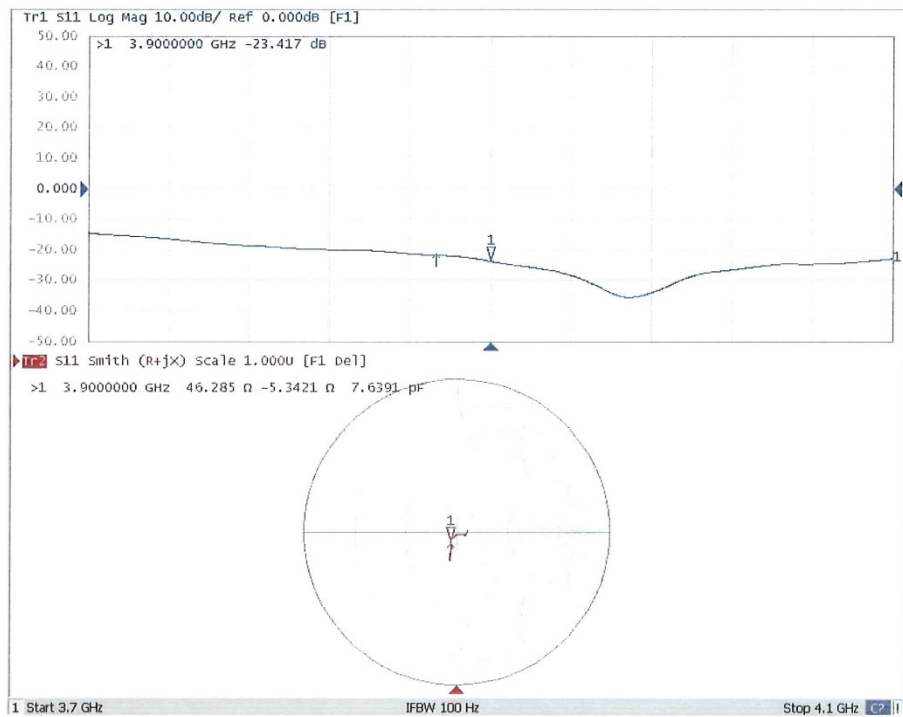
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**Impedance Measurement Plot for Head TSL**

**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°C-25°C 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:**

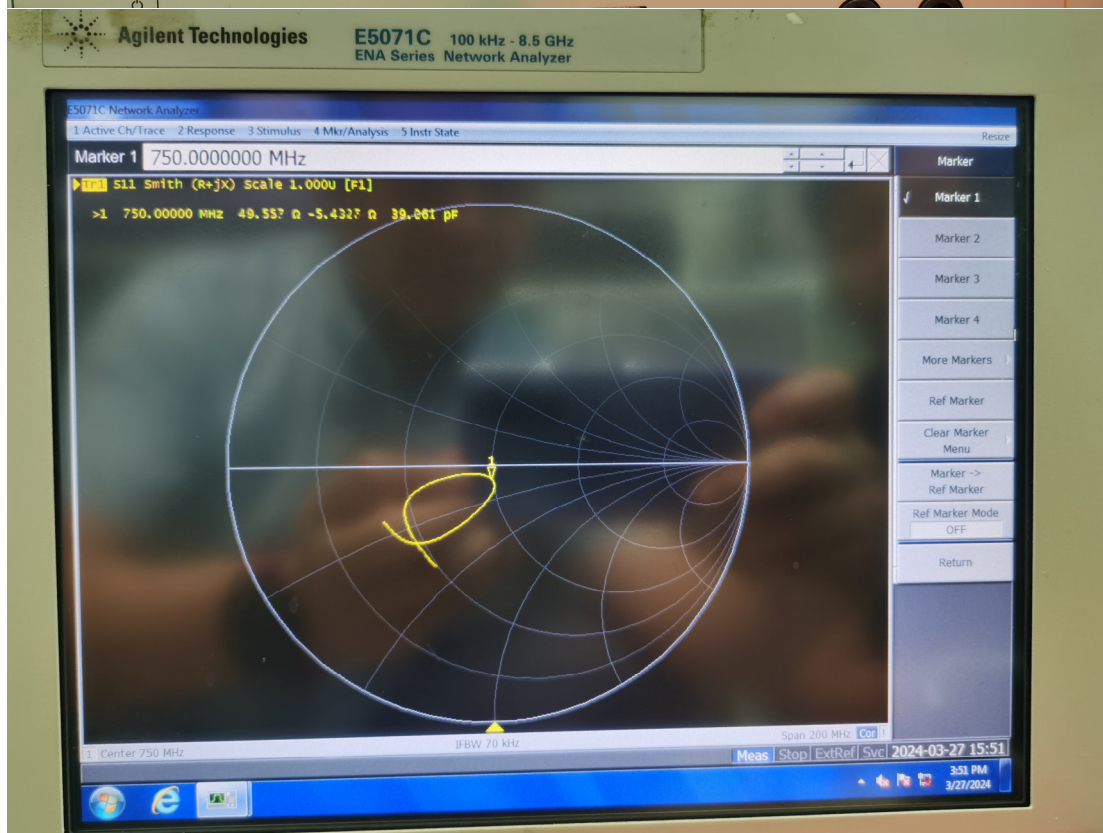
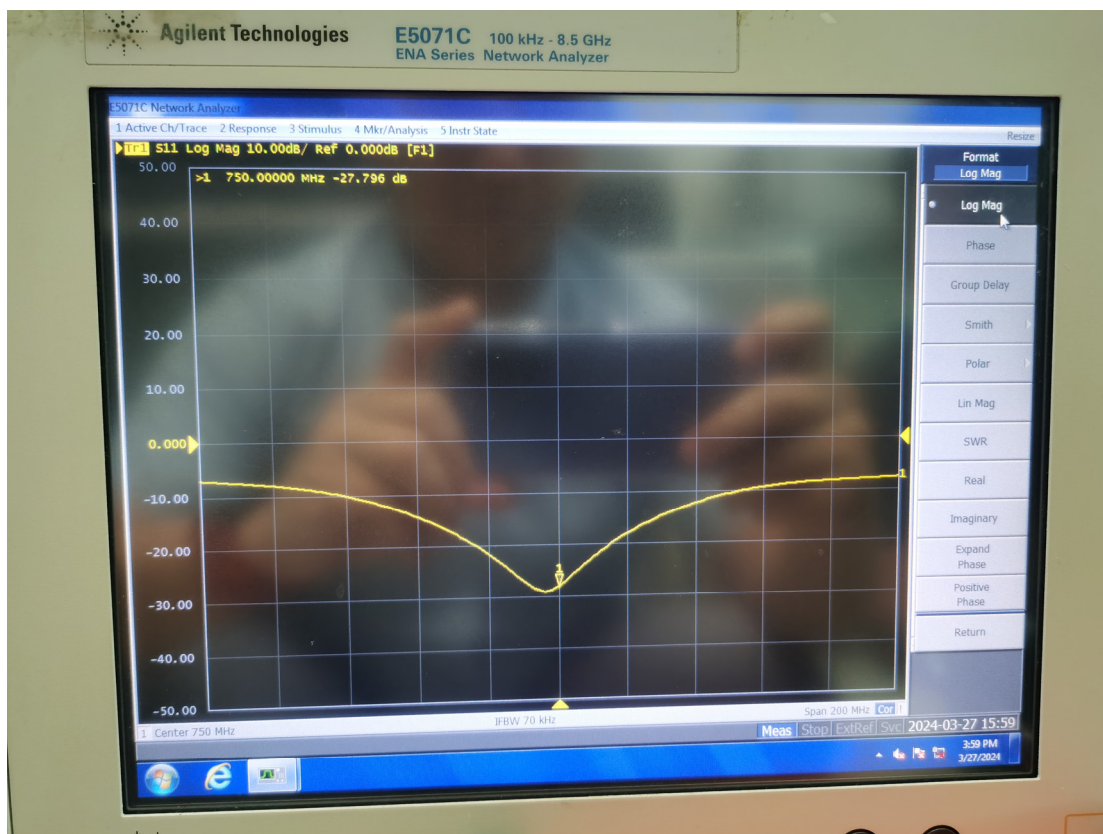
| Equipment                        | Model           | S/N            | Calibration Date | Calibration Due Date |
|----------------------------------|-----------------|----------------|------------------|----------------------|
| Simulated Tissue Liquid Head     | HBBL600-10000V6 | 2200808-2      | Each 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°C-25°C 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.

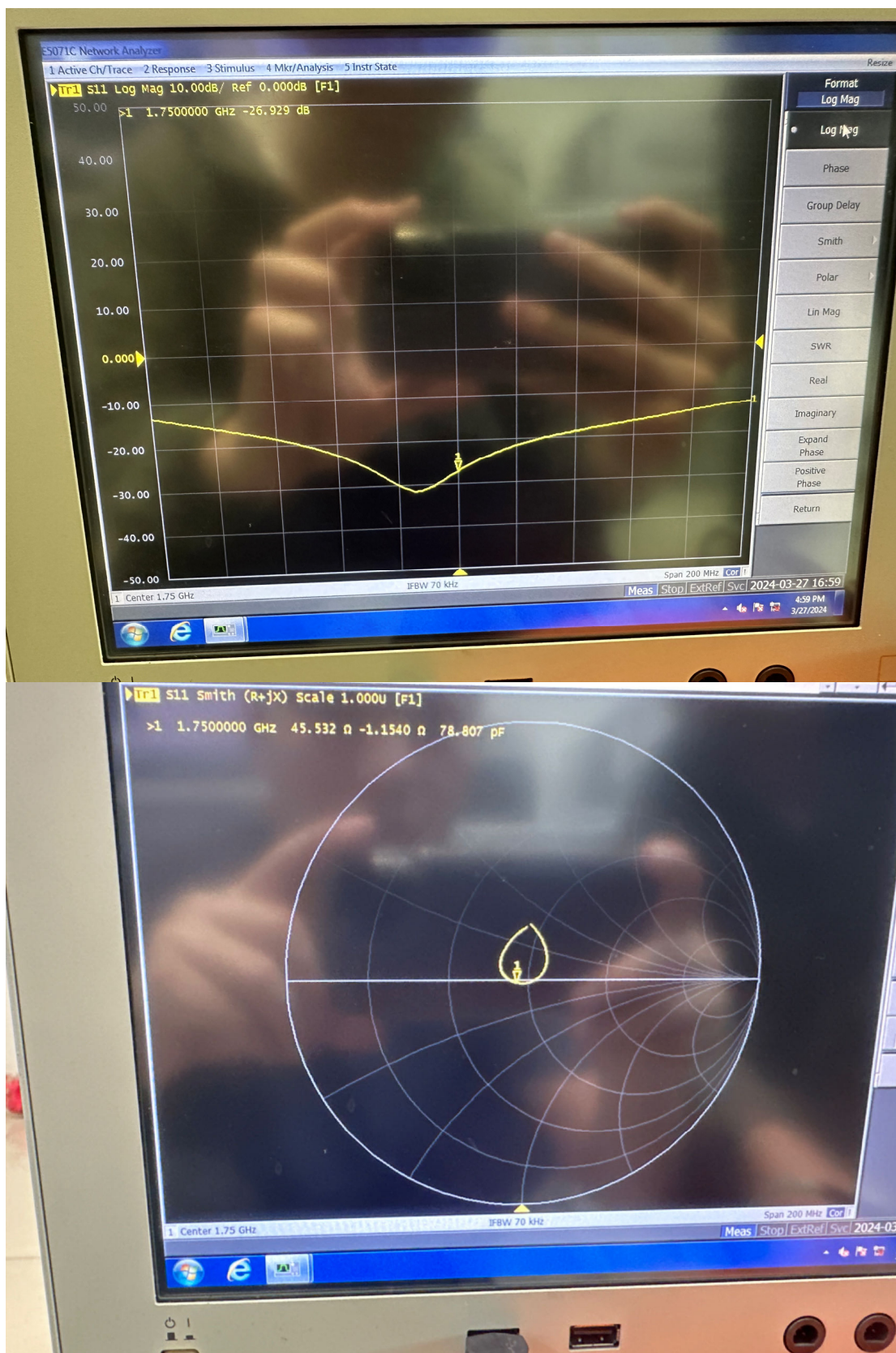
**Calibrated Equipment:**

| 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°C-25°C 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.

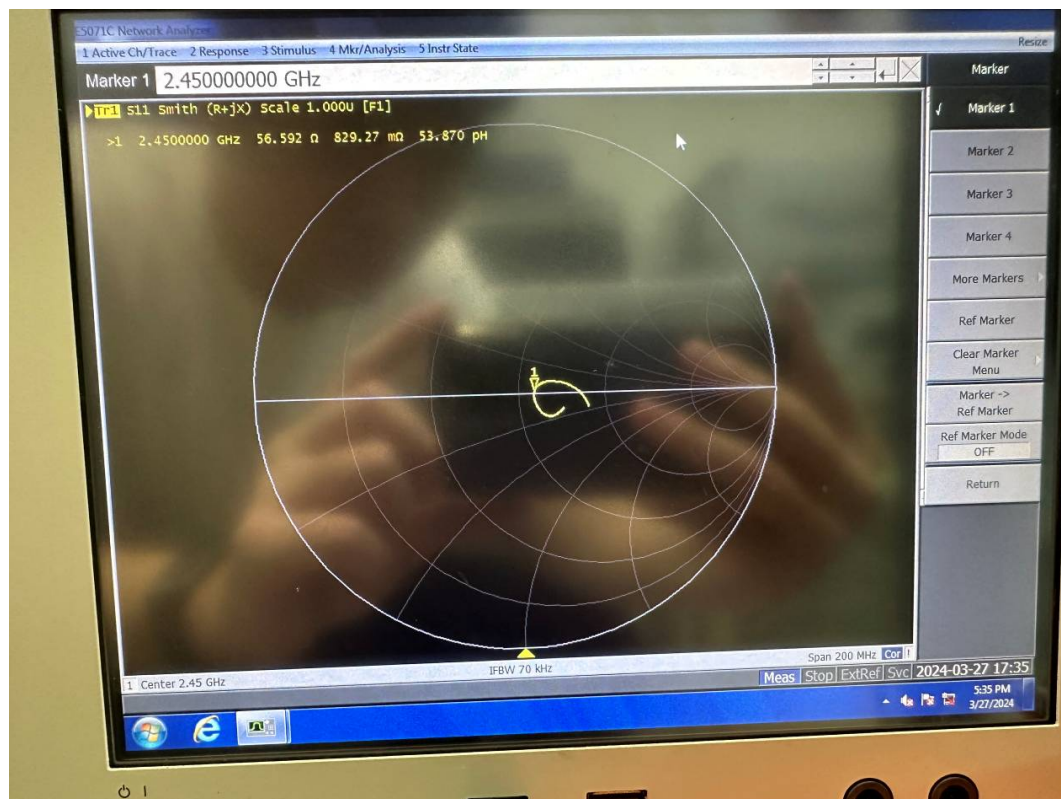
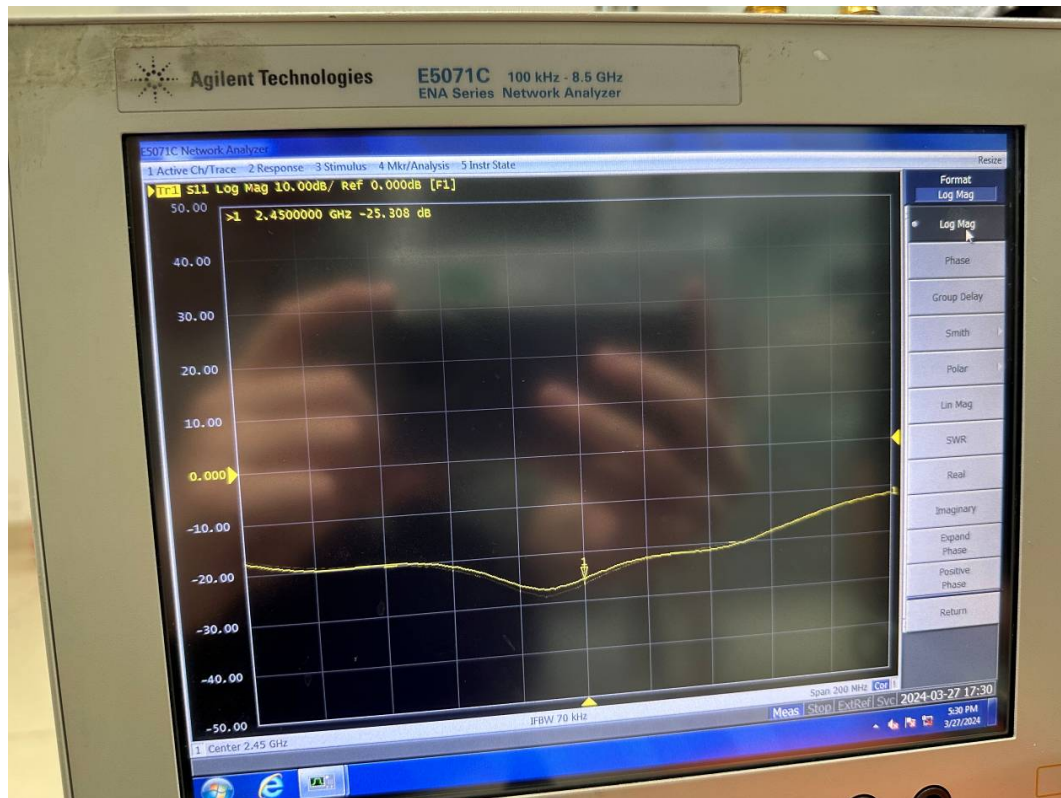
**Calibrated Equipment:**

| 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°C-25°C 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”

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

