

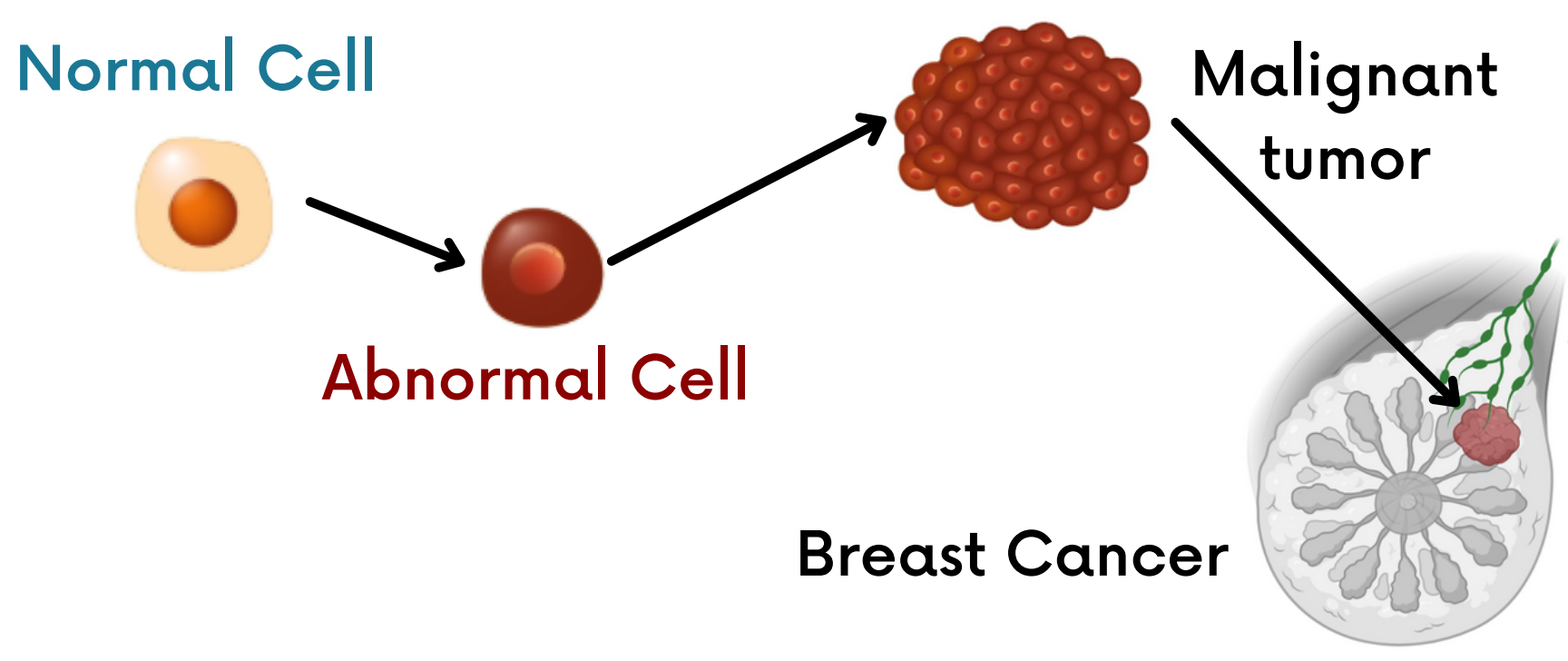
A SMART TEXTILE SYSTEM FOR EARLY DETECTION OF BREAST CANCER USING ELECTRICAL IMPEDANCE TOMOGRAPHY

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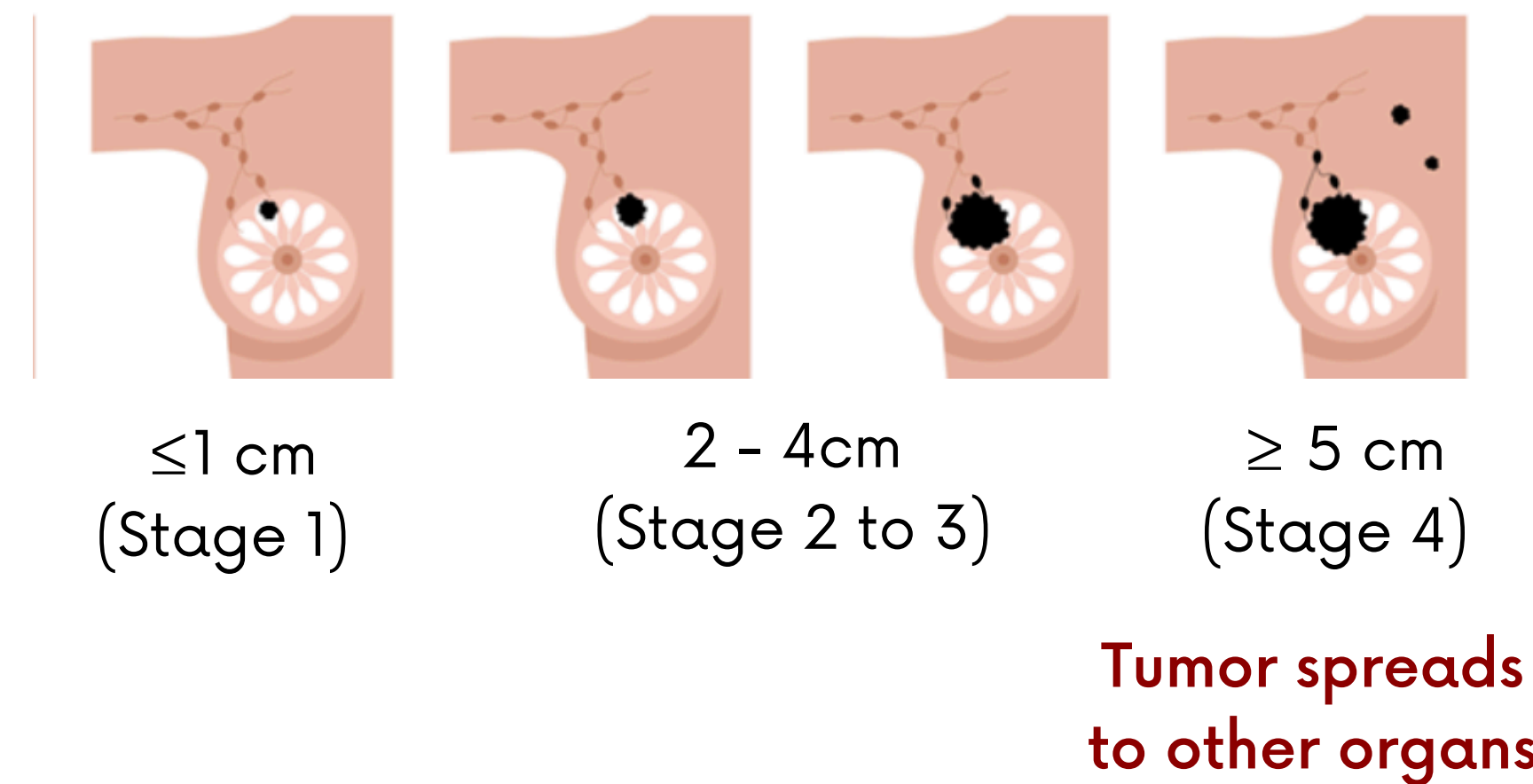


Our Current Understanding

What is Breast Cancer?



Tumor Size & Staging



UK Statistics

1 in 7 UK women will develop breast cancer
11,400 deaths/year

Screening Challenges

Mammography

- Limitations:**
- Radiation exposure
 - Age restrictions (≥50)
 - 15% false negatives

MRI

- Limitations:**
- High cost (£300–£500/session)
 - Limited accessibility.

Physical Examination

- Limitations:**
- Low sensitivity for early-stage tumors.

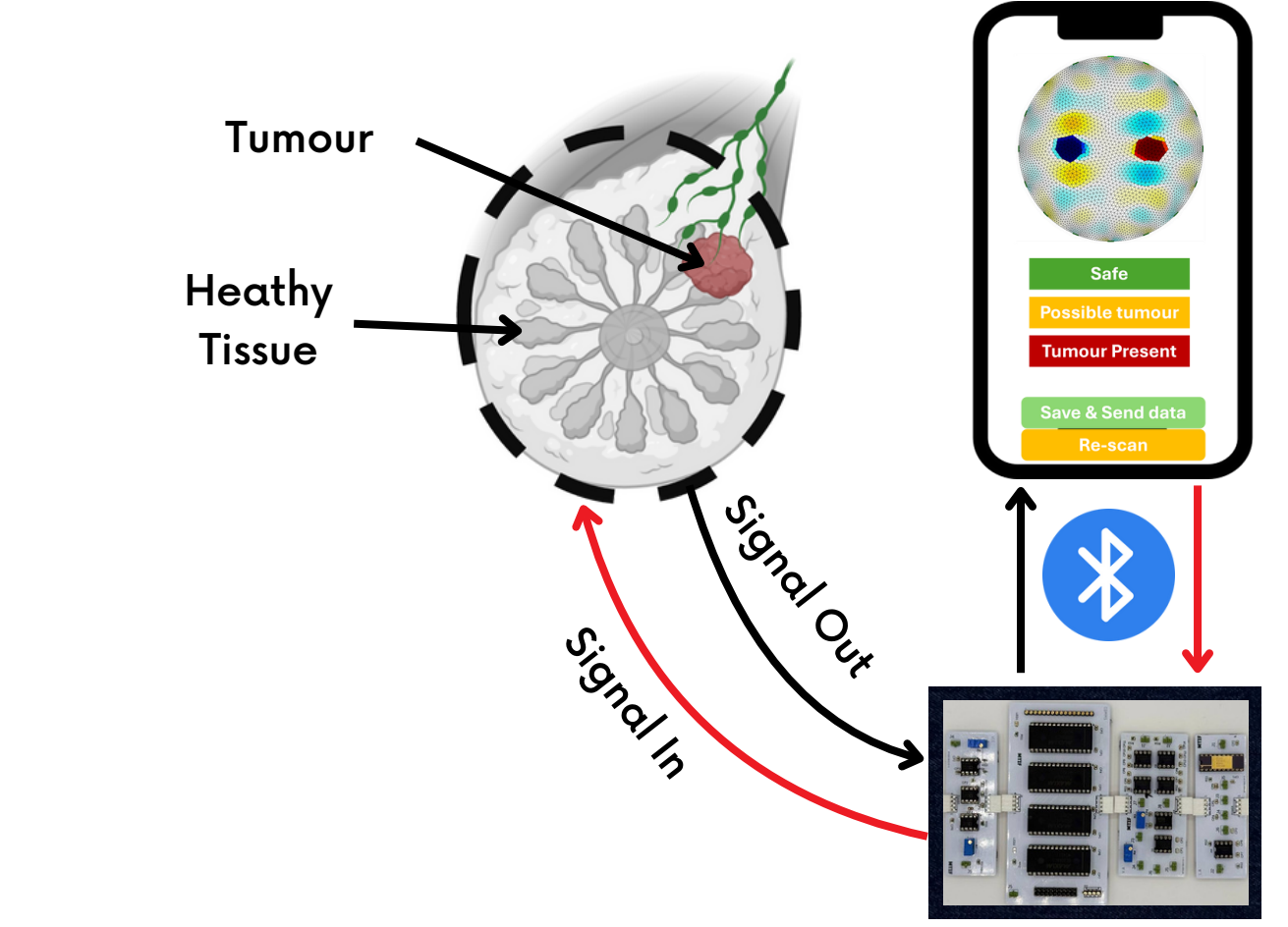
Gold Standard

Electrical Impedance Tomography (EIT) Basics

Impedance = Resistance + Capacitive Reactance

$$X_c = \frac{1}{2\pi f c}$$

How Our EIT Works



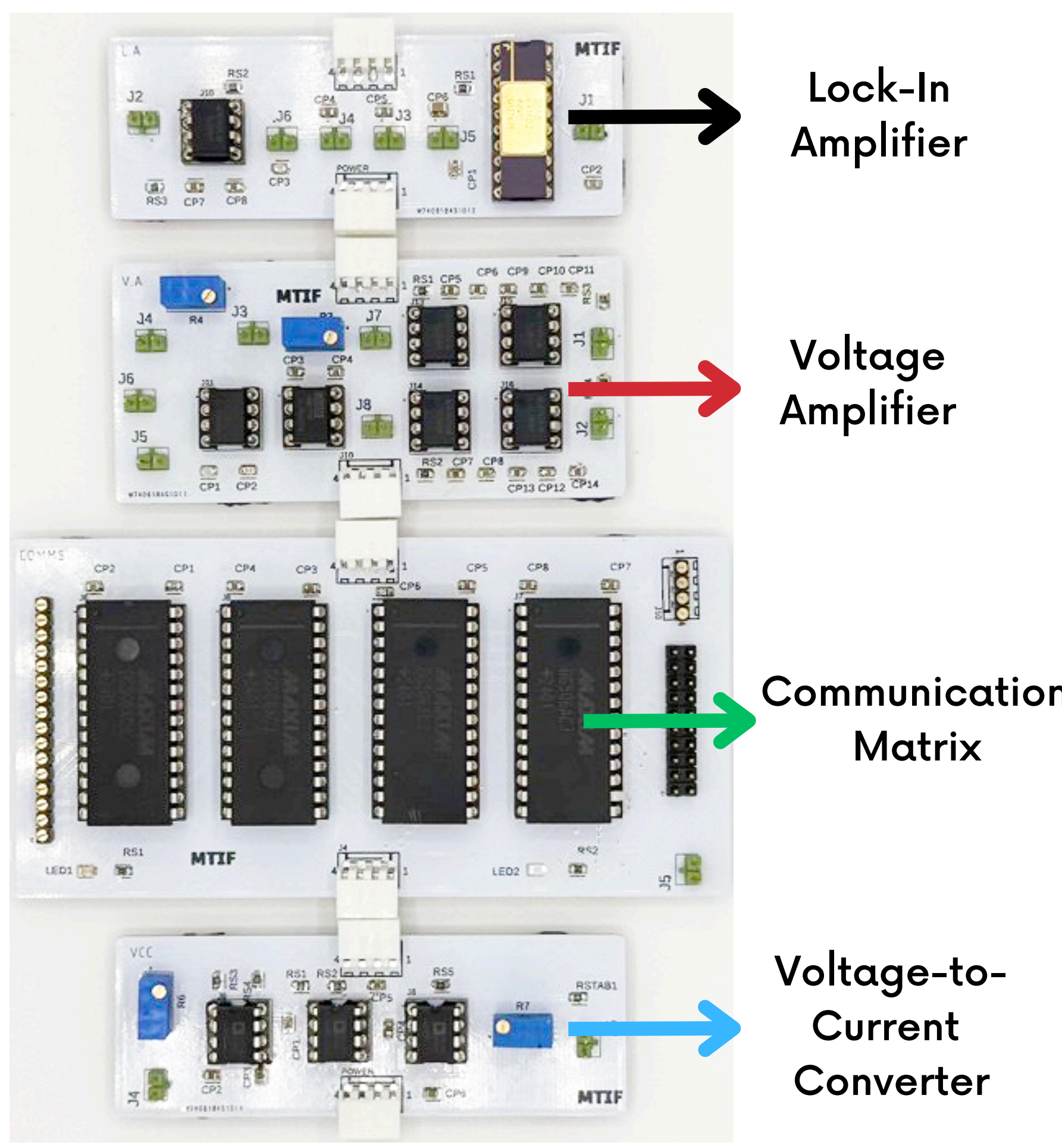
Our Hypothesis

Our EIT system can detect breast tumors as small as 1 cm (Stage 1).

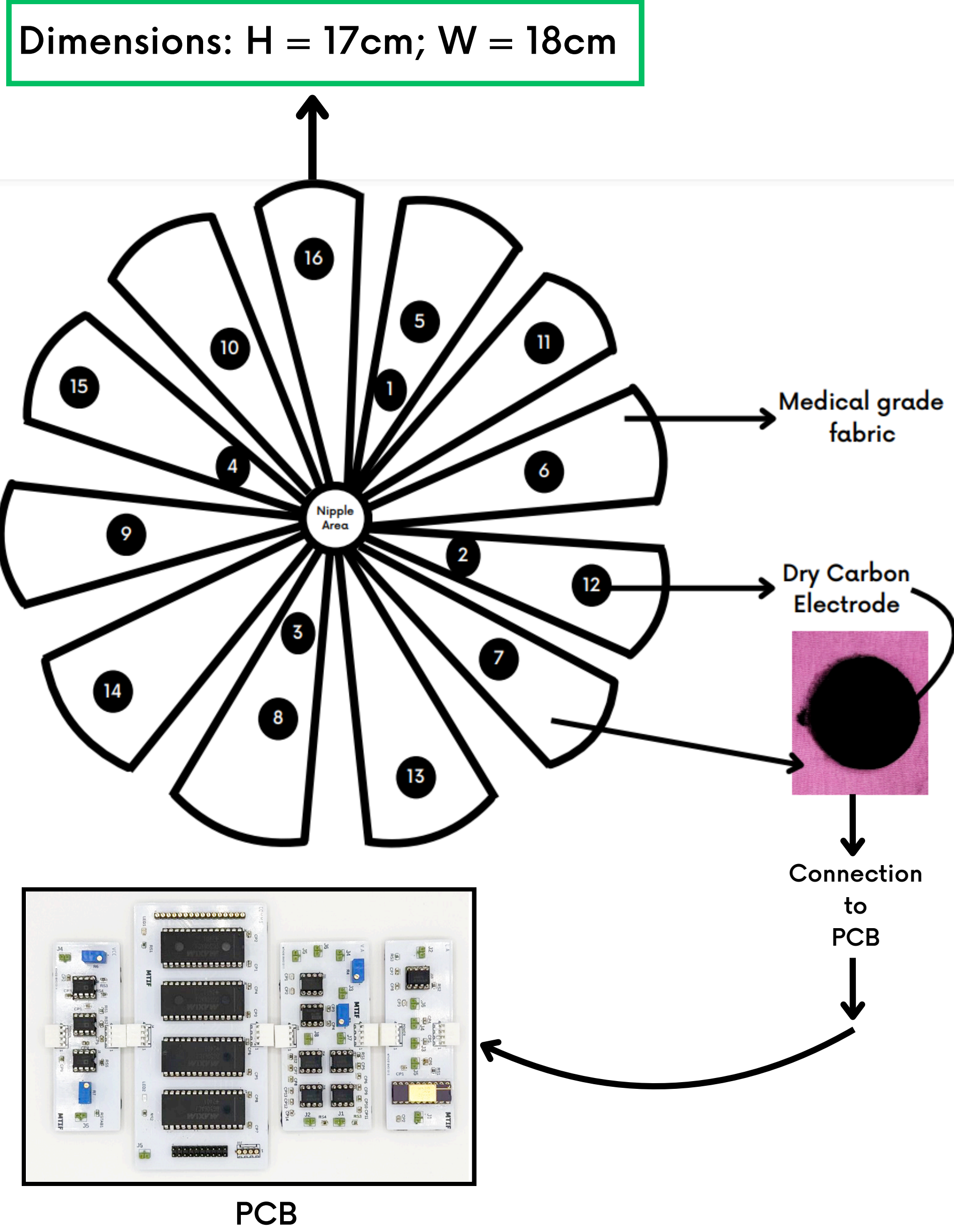


Our Approach: Smart Bra Patch

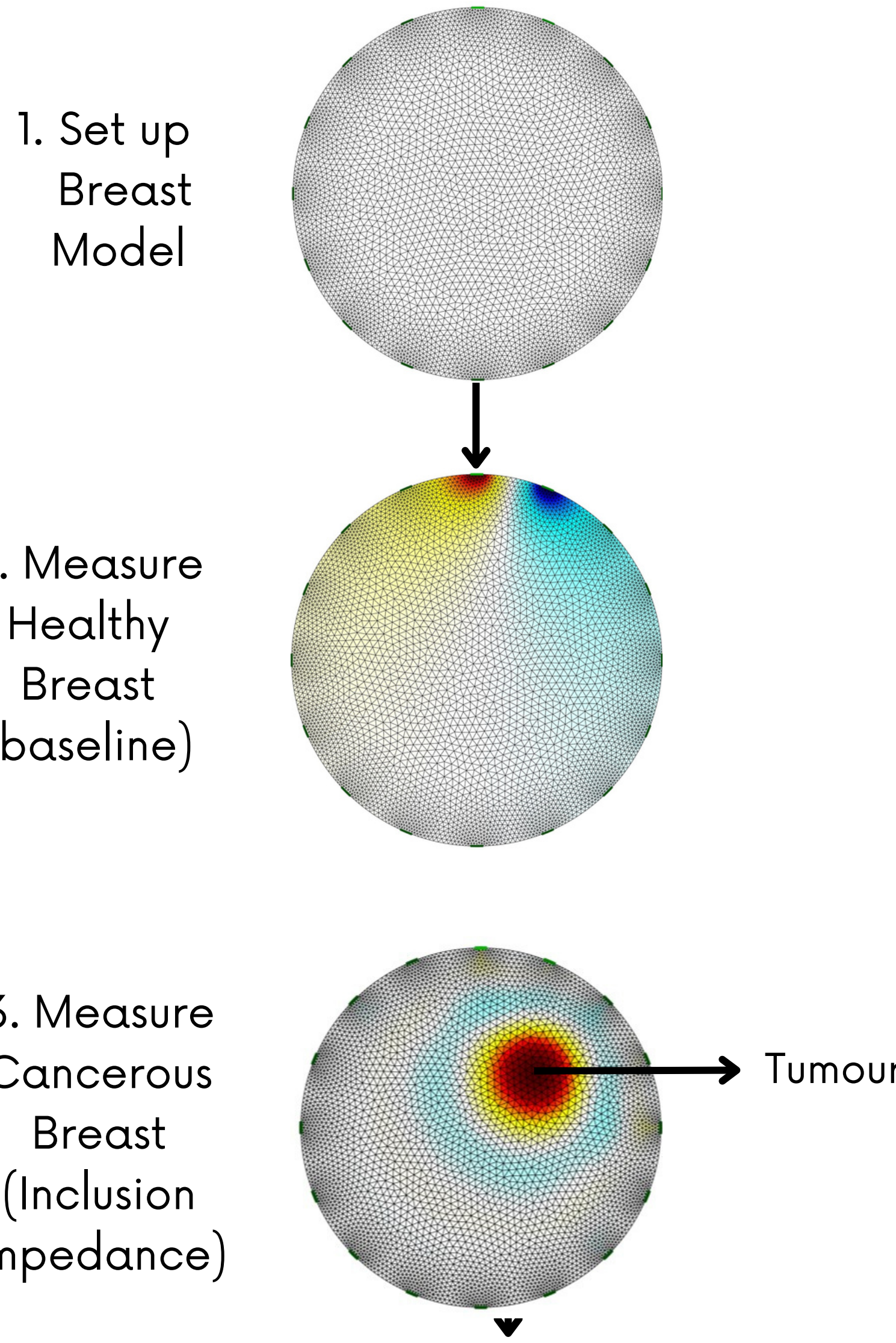
EIT PCB Hardware



Breast Patch & Electrodes



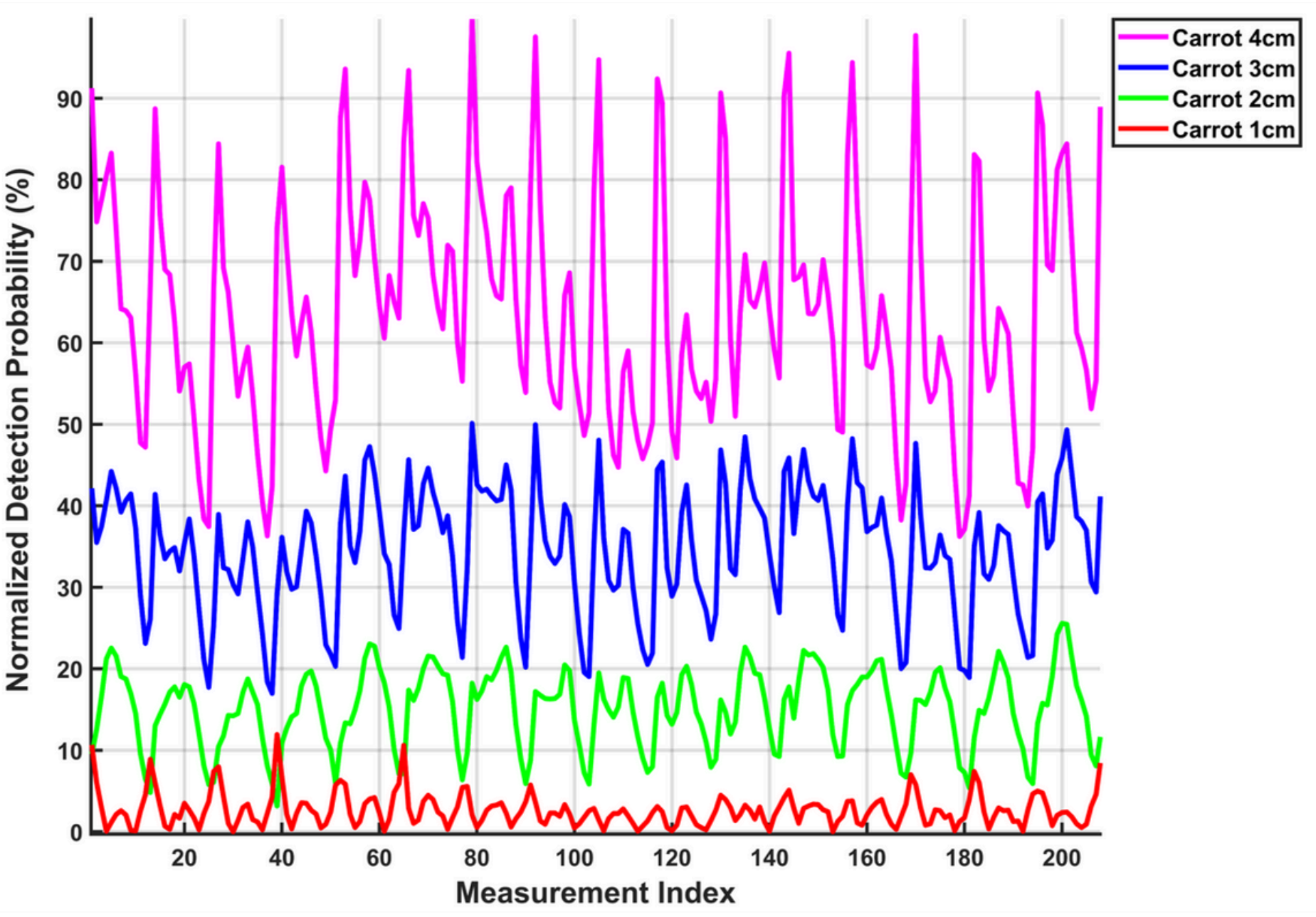
Measurement to Detection



What Did We Find?



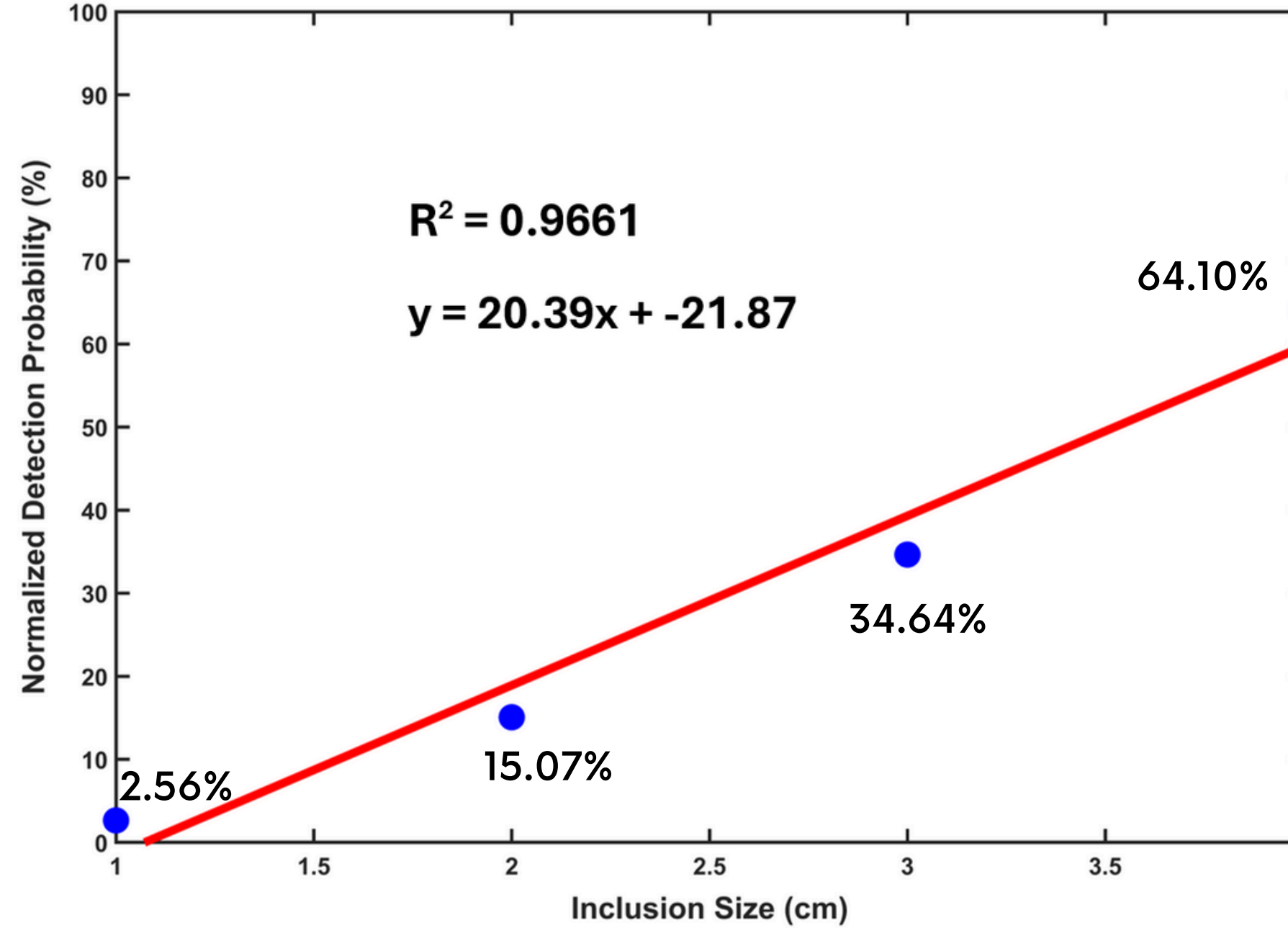
1. Chance of Detection



Key Insight 1

Carrots have been shown in previous studies to mimic the electrical properties of tumours

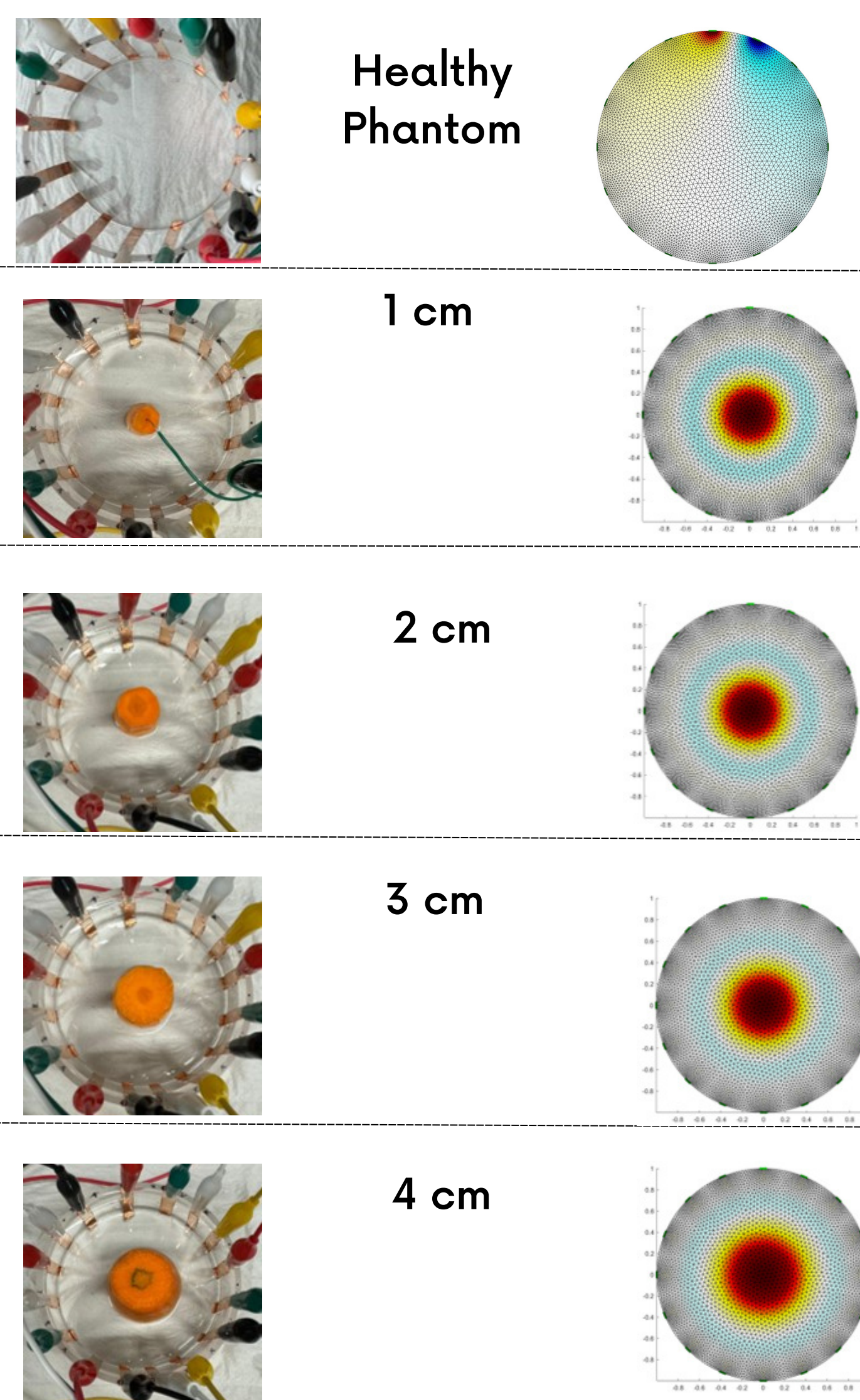
2. Size Effect on Detection Probability



Key Insight 2

Carrots effectively mimic malignant tissue impedance, validating EIT's ability to detect tumors as small as 1 cm (Stage 1)

3. EIDORS Image Reconstruction



What Does this Mean for Patients ?

Transforming Breast Cancer Screening: Safer, Sooner, Smarter.

1. Revolutionizing Early Detection

A. Radiation-Free Screening

- No exposure to harmful X-rays (vs. mammography).
- Safe for frequent, lifelong monitoring.

B. Stage 1 Tumor Detection

- 95% 5-year survival rate when detected early.

2. Accessibility and Comfort

A. Age-Inclusive

- Overcomes UK's age-restricted screening policies (≥50 years).
- Empowers younger women and high-risk groups (e.g., BRCA1/2 carriers).

B. Wearable Design

- Discreet, comfortable bra patch for home use.
- No clinic visits or uncomfortable compression.

3. Cost-Effective Care

A. Affordable Alternative

- Estimated cost: £200/device (vs. £300–£500 per MRI scan).
- Reduces long-term healthcare burdens.

B. Global Scalability

- Potential for use in low-resource settings.

4. Psychological Impact

A. Peace of Mind

- Continuous monitoring reduces anxiety between screenings.

B. Empowerment

- Patients access real-time data via smartphones.

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