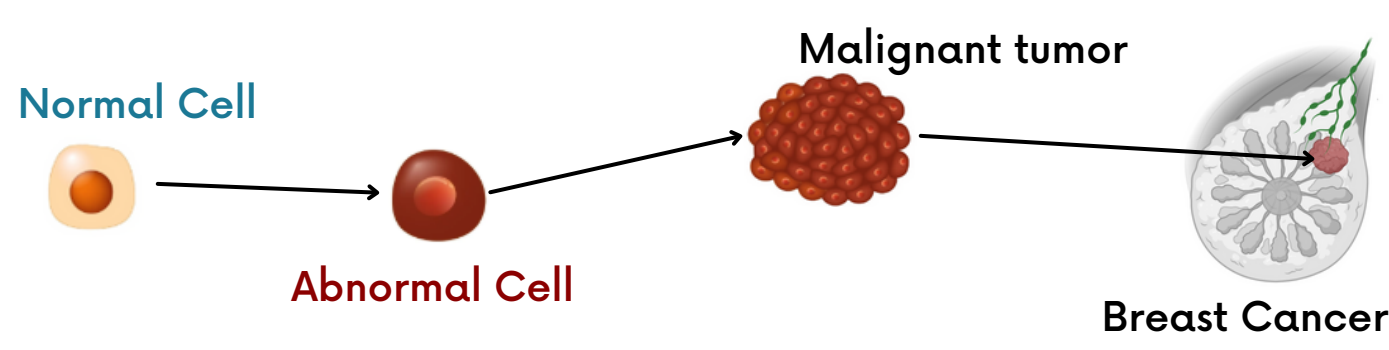


# A SMART TEXTILE SYSTEM FOR EARLY DETECTION OF BREAST CANCER USING ELECTRICAL IMPEDANCE TOMOGRAPHY

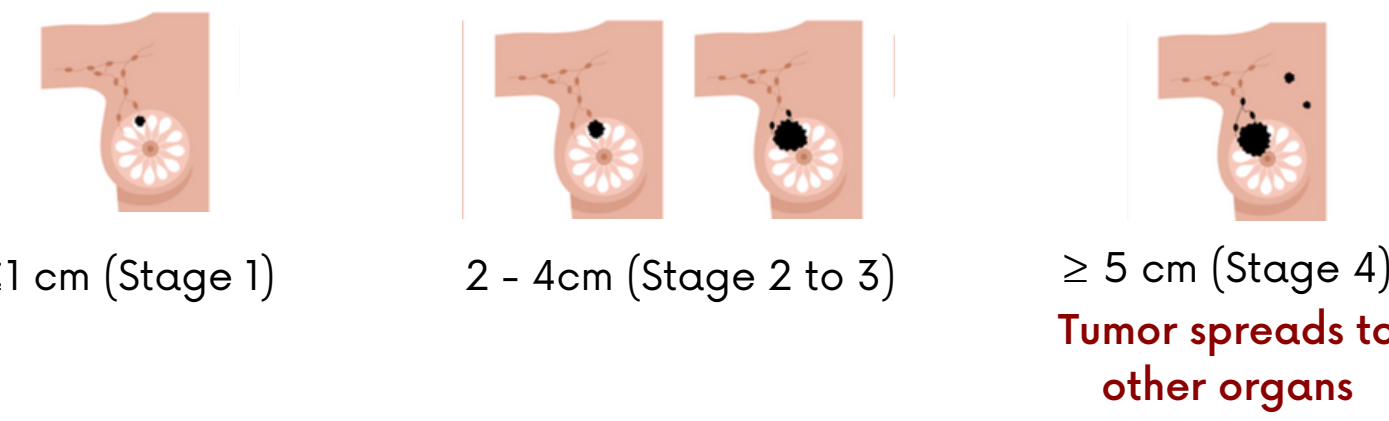
Shadrack O. Aboagye, John Hunt, Graham Ball, Yang Wei

## 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

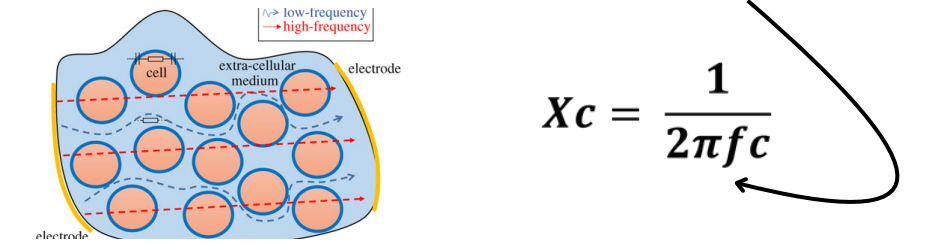
### Screening Challenges

- 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.

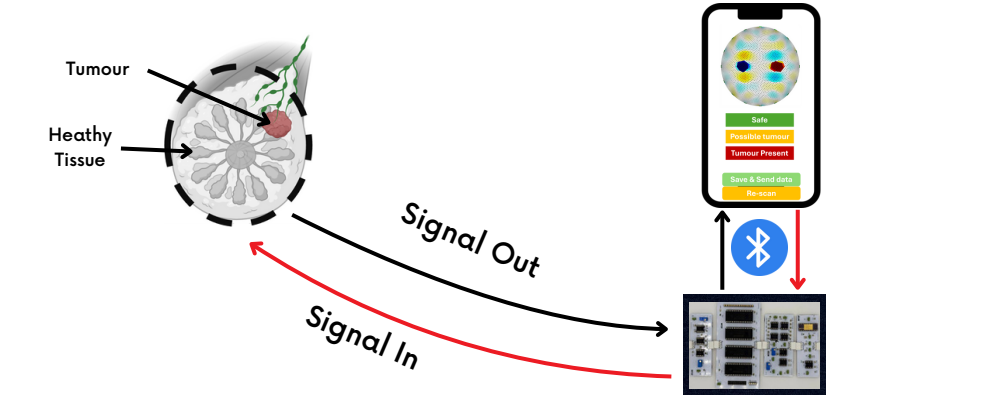
Gold Standard

### Electrical Impedance Tomography (EIT) Basics

Impedance = Resistance + Capacitive Reactance



### How Our EIT Works

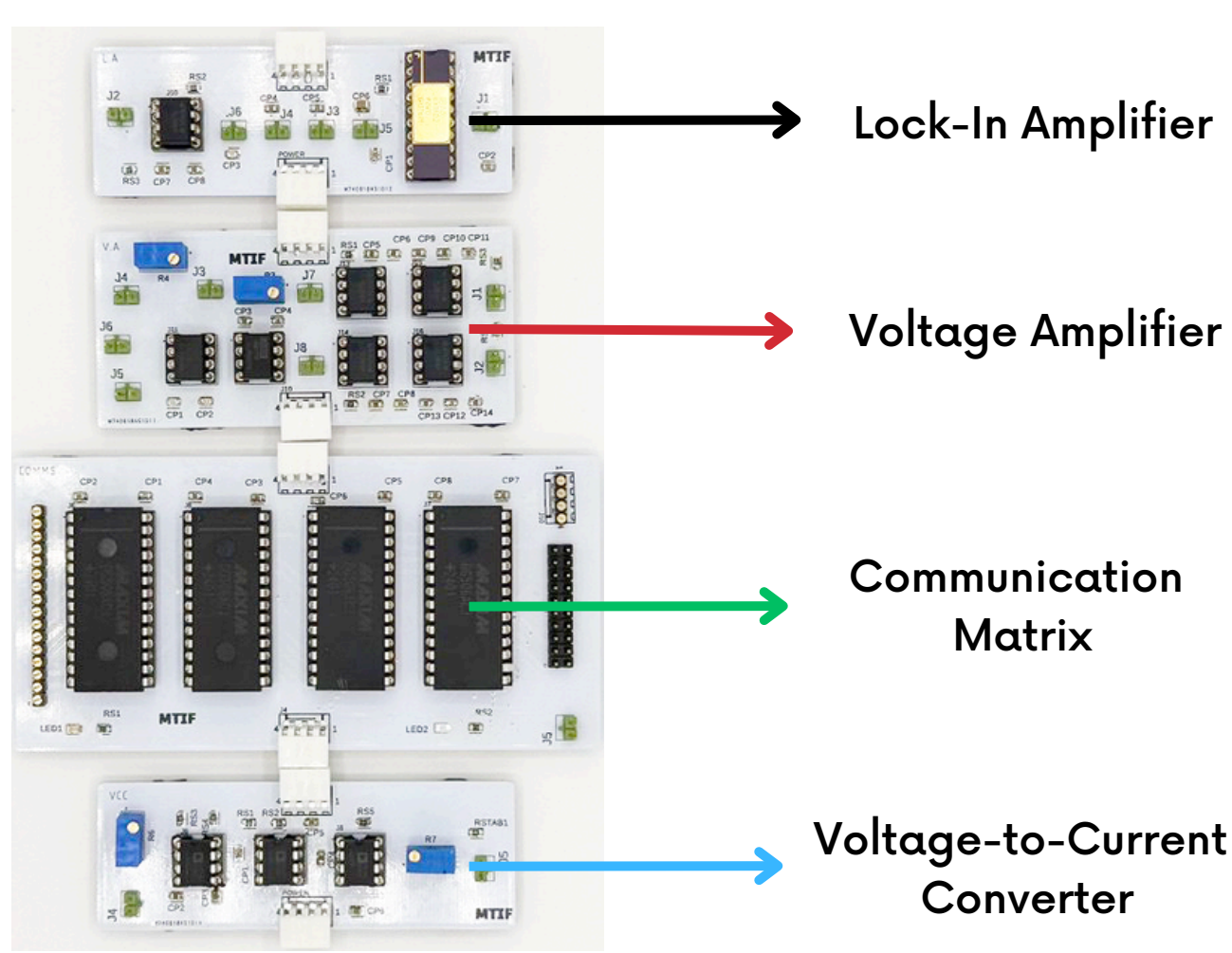


### Our Hypothesis

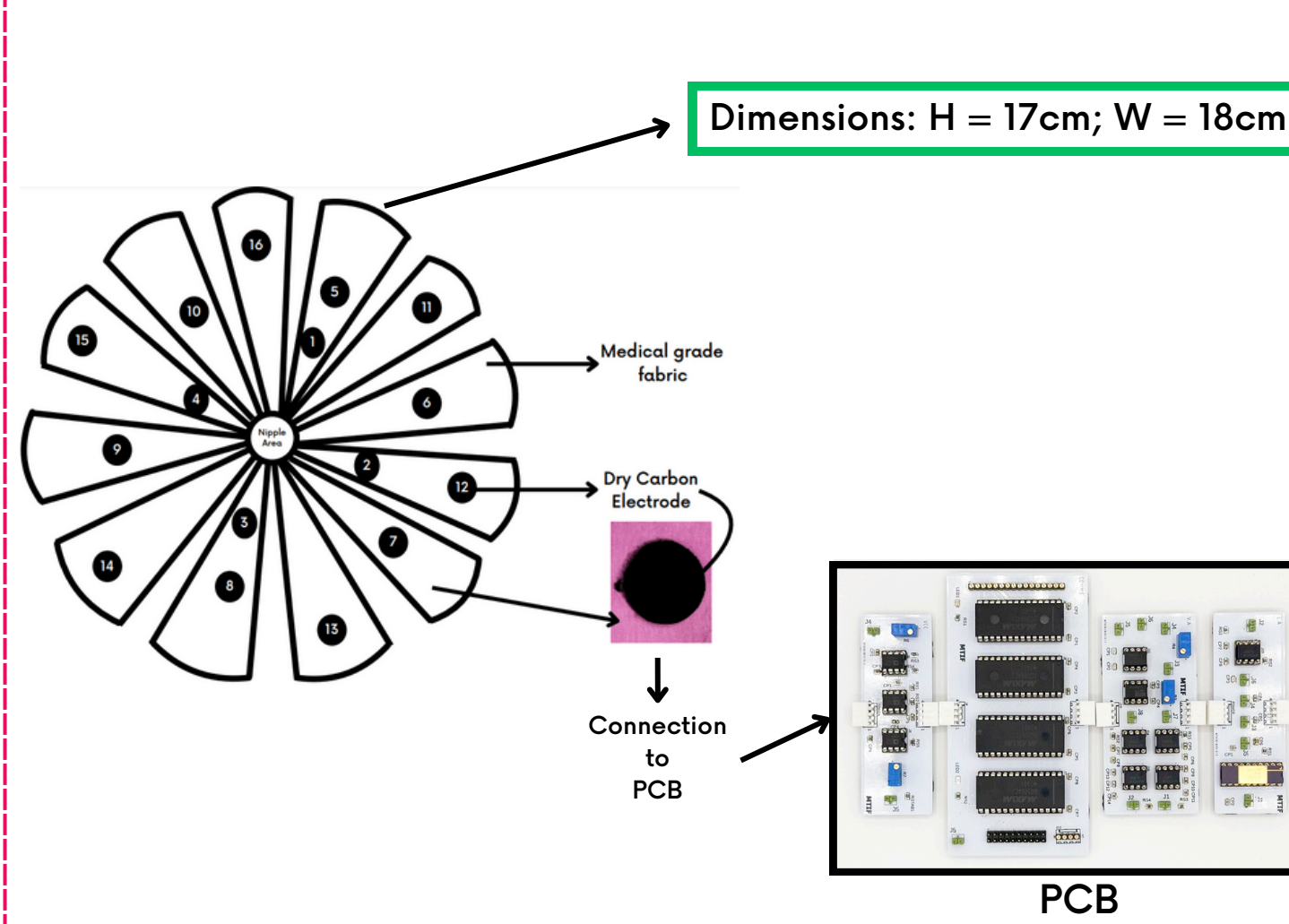
Our EIT system can detect breast tumors as small as 1 cm (Stage 1).

## Our Approach: Smart Bra Patch

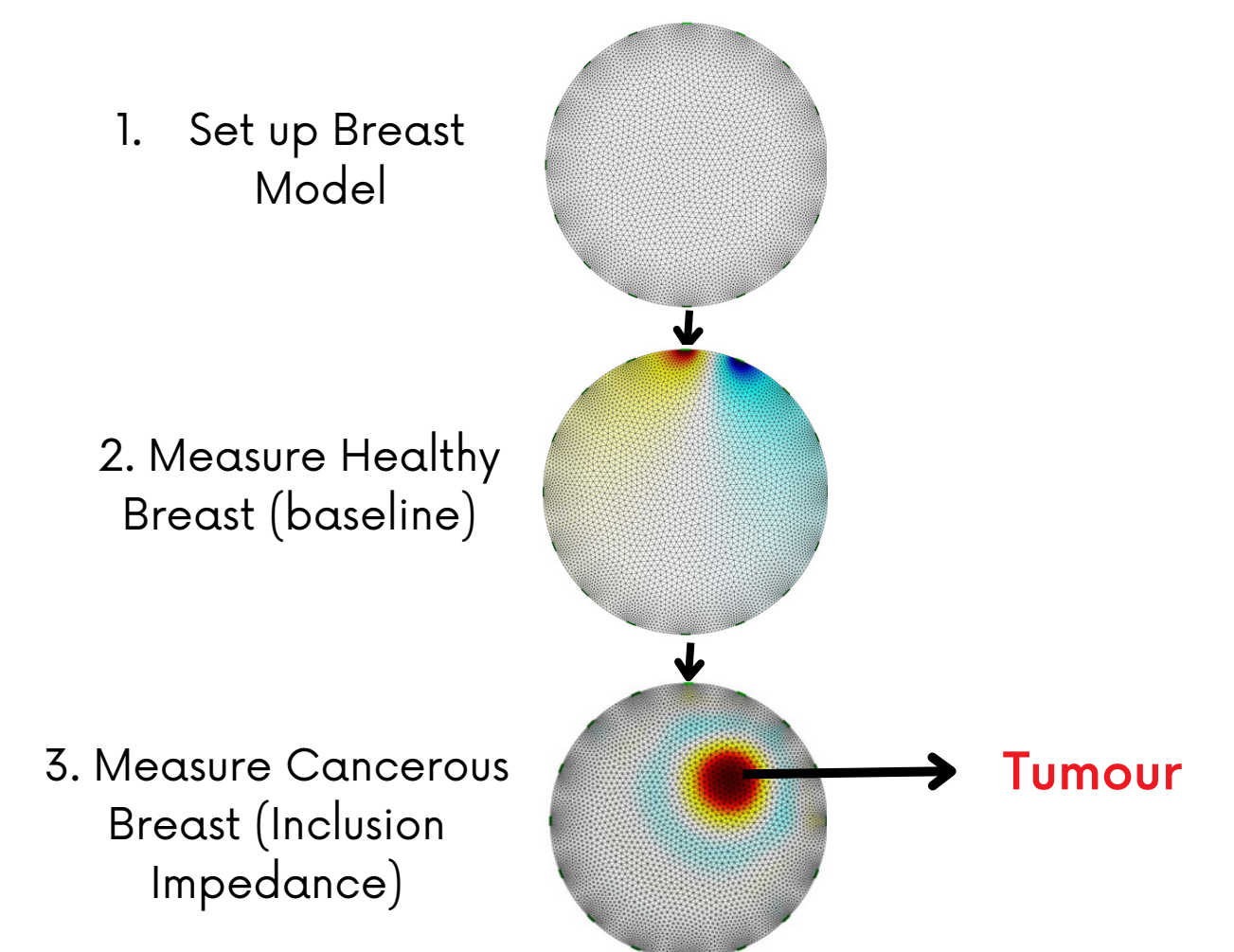
### EIT PCB Hardware



### Breast Patch & Electrodes

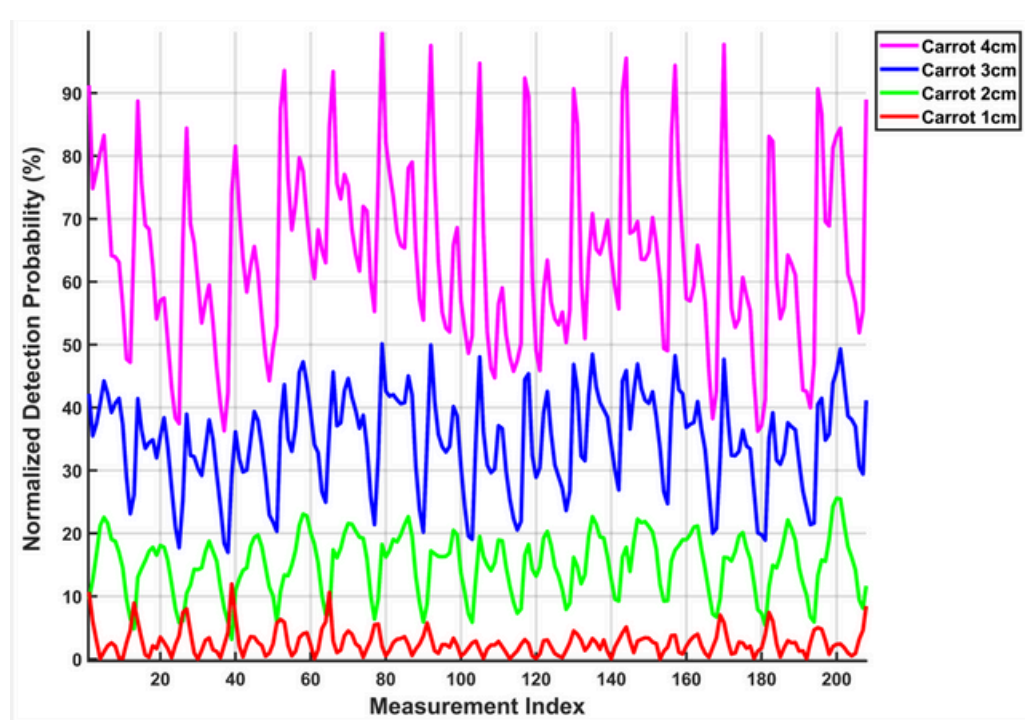


### Measurement to Detection



## What Did We Find?

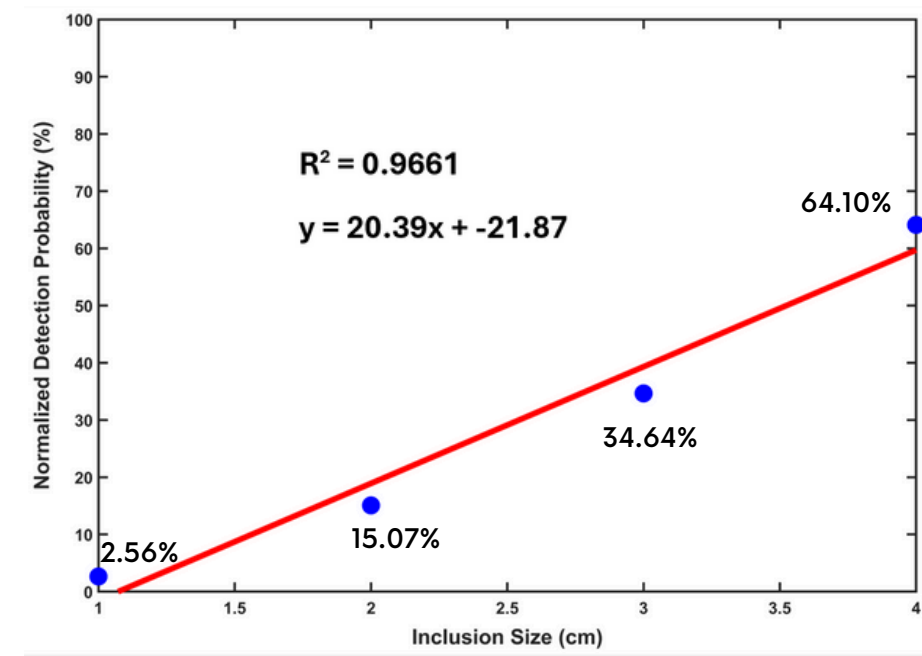
### 1. Chance of Detection



Key Insight 1: Carrots have been shown in previous studies to mimic the electrical properties of tumours

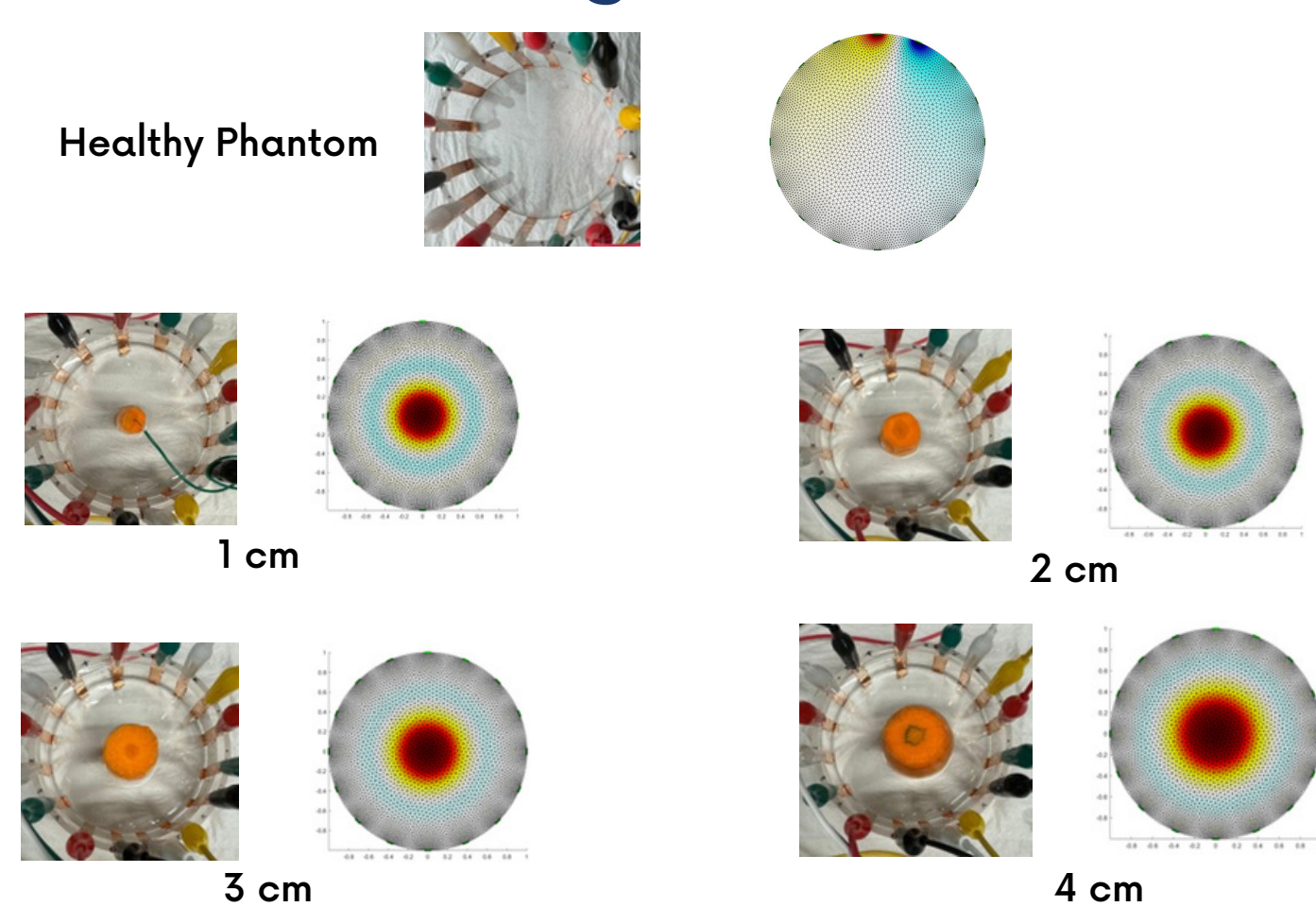
### 2. Carrot Tumour Phantom Studies

#### Size Effect on Detection Probability



Key Insight 2: Carrots effectively mimic malignant tissue impedance, validating EIT's ability to detect tumours 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.