

Active Nanomaterials and Devices Laboratory

# Hyperspectral Ultrasound Transducers Based on PZT Nanofibers

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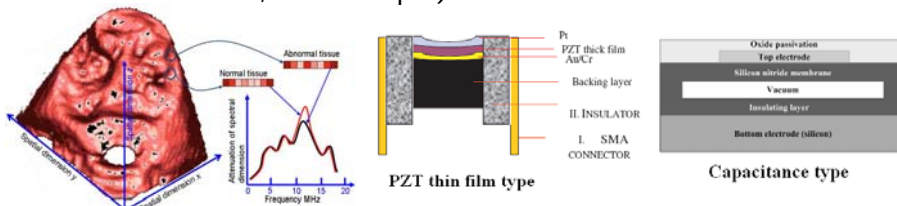
Mechanical Engineering Department



## Motivation and Objective

### □ Motivation

5D Medical imaging system (3 spatial, 1 temporal & 1 spectral) for medical imaging and diagnostics (providing spectral signatures for cancerous tissues, for example)



Current ultrasound transducers and problems:  
Low frequency & narrow bandwidth

### □ Objectives:

Developing hyperspectral ultrasound transducers (HUT) with frequency range of 1MHz~20 MHz and above

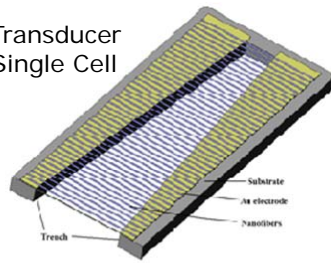


## Proposed HUTs

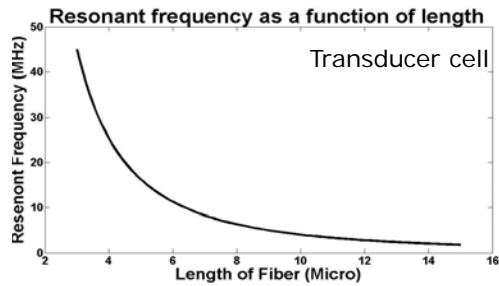
Hyperspectral Ultrasound Transducers based on PZT nanofibers

- **Concept 1:** Hyperspectral ultrasound transducer with variable nanofiber lengths

Transducer  
Single Cell



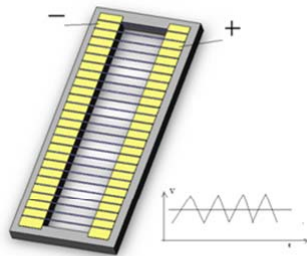
Concept1: Cell of HUT with variable length of PZT nanofibers



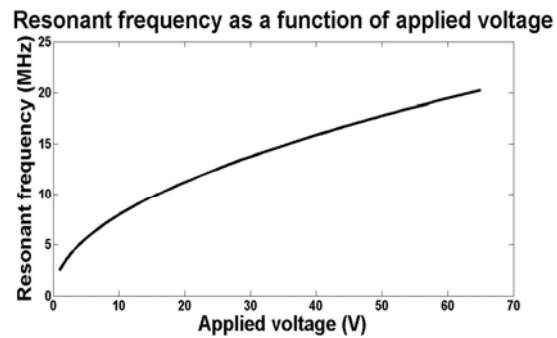
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## Proposed HUTs

- **Concept2:** Hyperspectral ultrasound transducer with stress induced frequency tuning

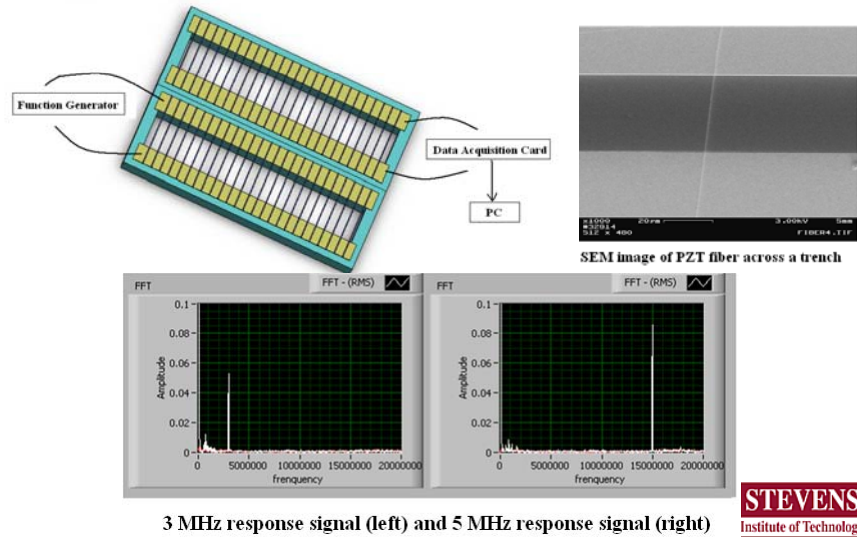


Concept2: Cell of HUT with tubable stress in PZT nanofibers

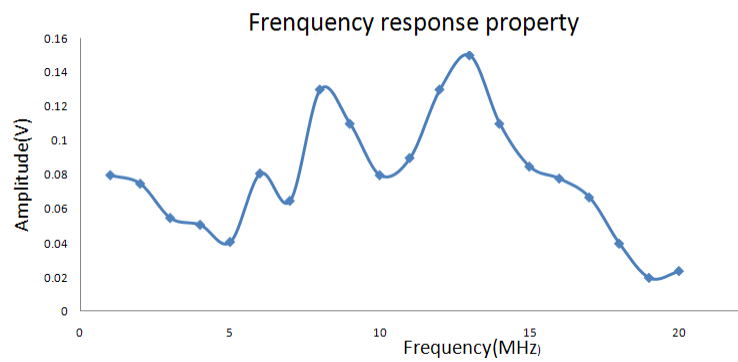


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## Experiment and Results



## Experiment and Results

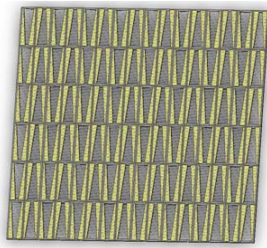


*Preliminary experiment results demonstrated the feasibility of transmitting/receiving ultrasound signals using PZT nanofibers in the expected frequency range*

## Future Works

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- ❑ Ultrasound transducer calibration
- ❑ Transducer cells and 2D array fabrication
- ❑ Beam forming by electronic focusing and accessories design



Large array of transducers

