



Functional Fiber Electronics

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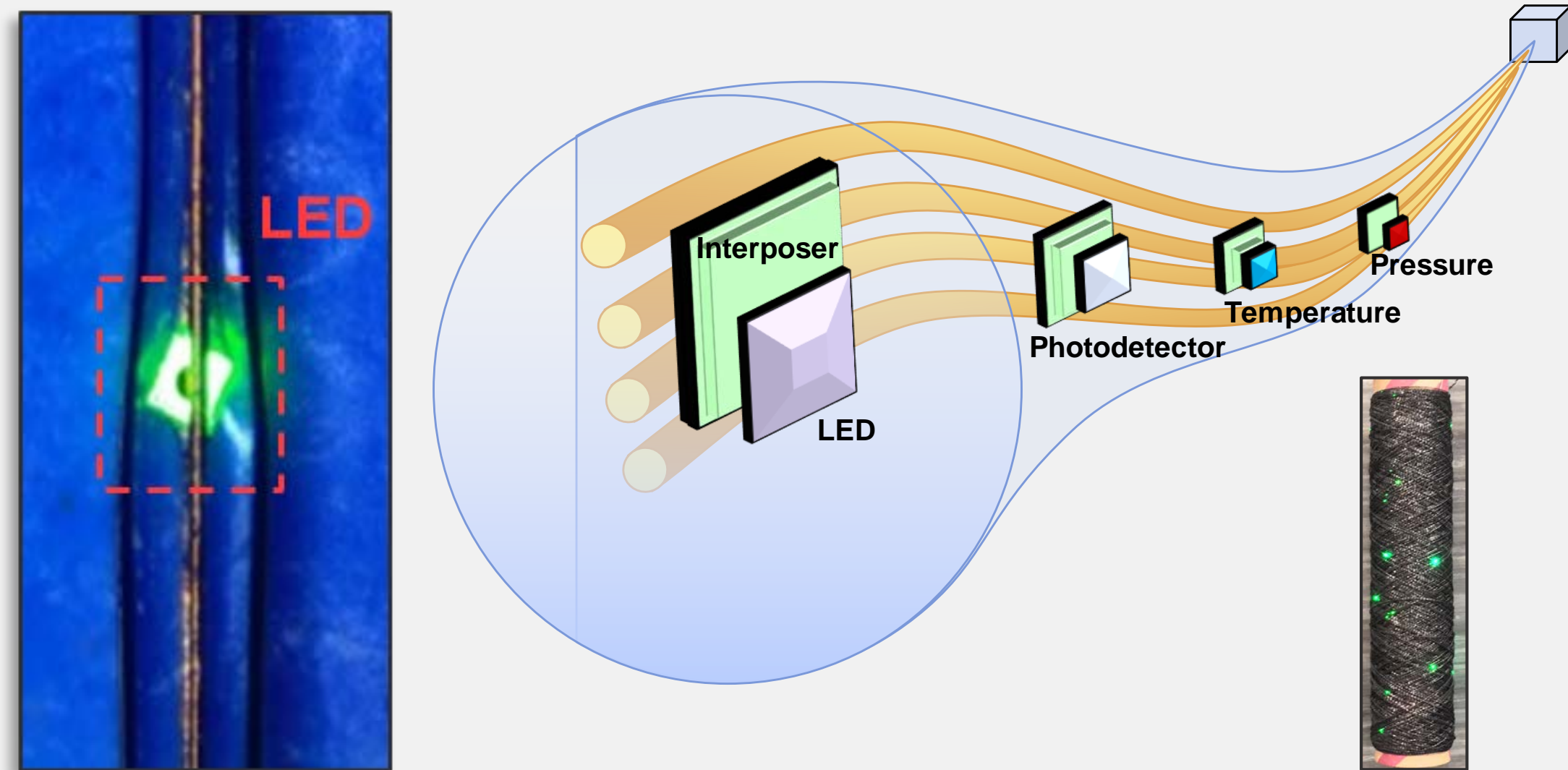


Specialized Functions



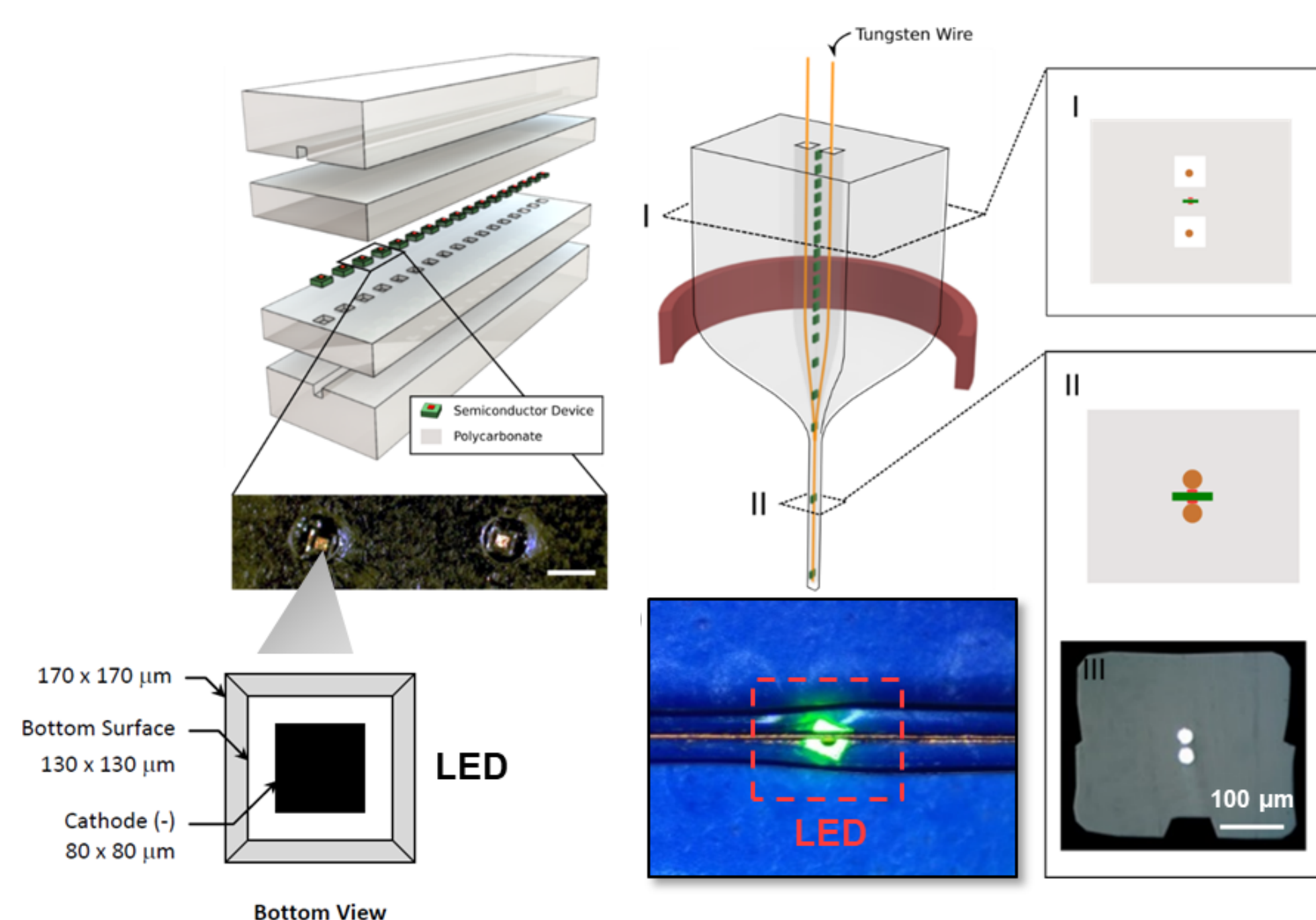
Overview

- MIT LL is developing novel fiber drawing approaches that support the use of microelectronics in fiber form factors at km length scales
- Leverages existing \$75M current federal investment into AFFOA Manufacturing USA Institute, one of three labs able to manufacture advanced fibers
- Technical approach integrates discrete 2 and 4 -terminal electronics with polymer-based fiber materials
- Goals of effort:
 - System-in-fiber platform development with DoD application focus
 - Develop a PDK for fiber microelectronics to enable defense community use of a prototyping fiber microelectronics foundry
 - Demonstrate broad range of component integration with capability toward an ocean sensing application



Background

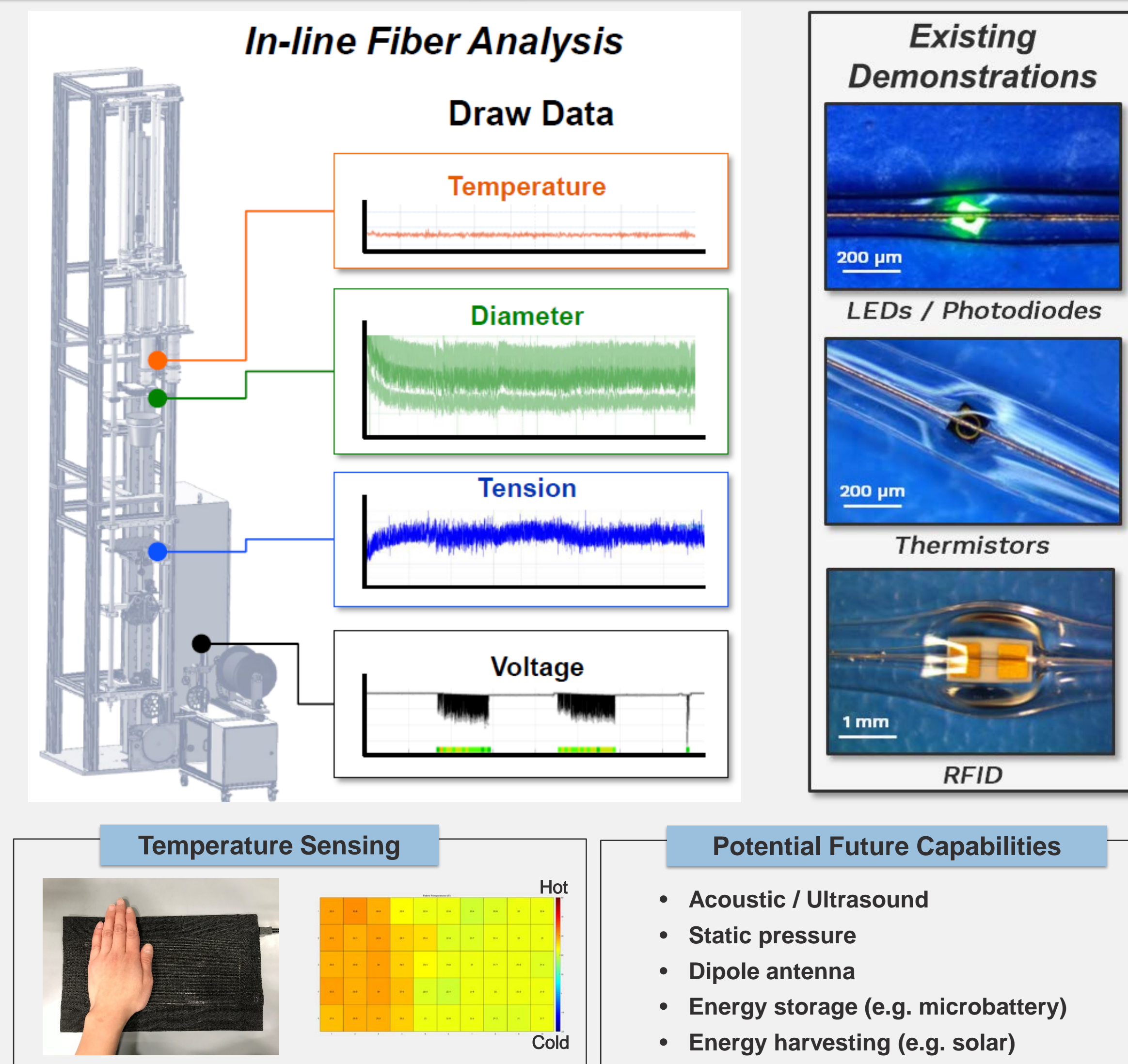
Discrete 2-terminal electronics



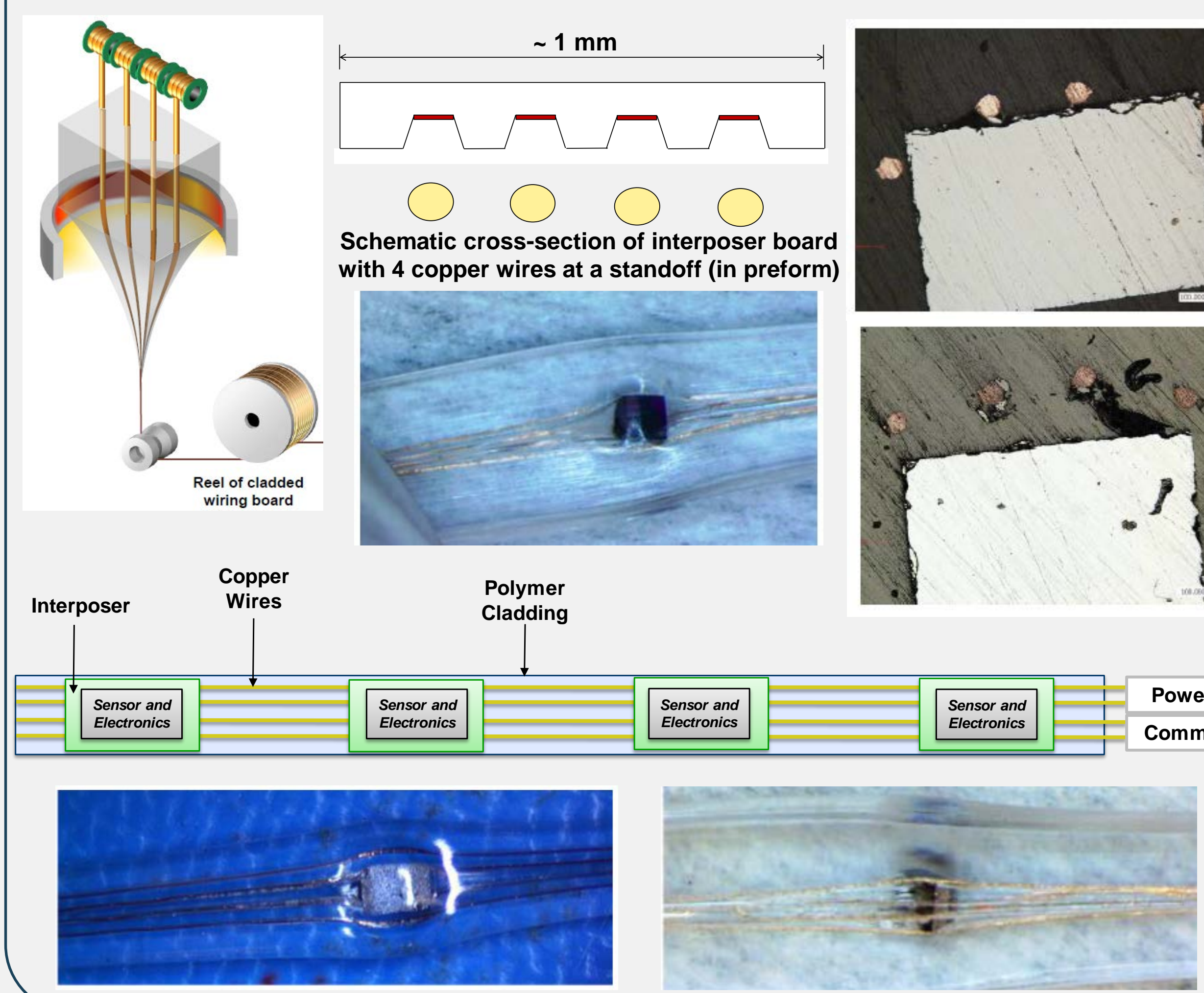
Cladding undergoes viscous flow while wires converge onto microelectronic chips during the draw

Rein et al., Nature 560 (2018)

Approach



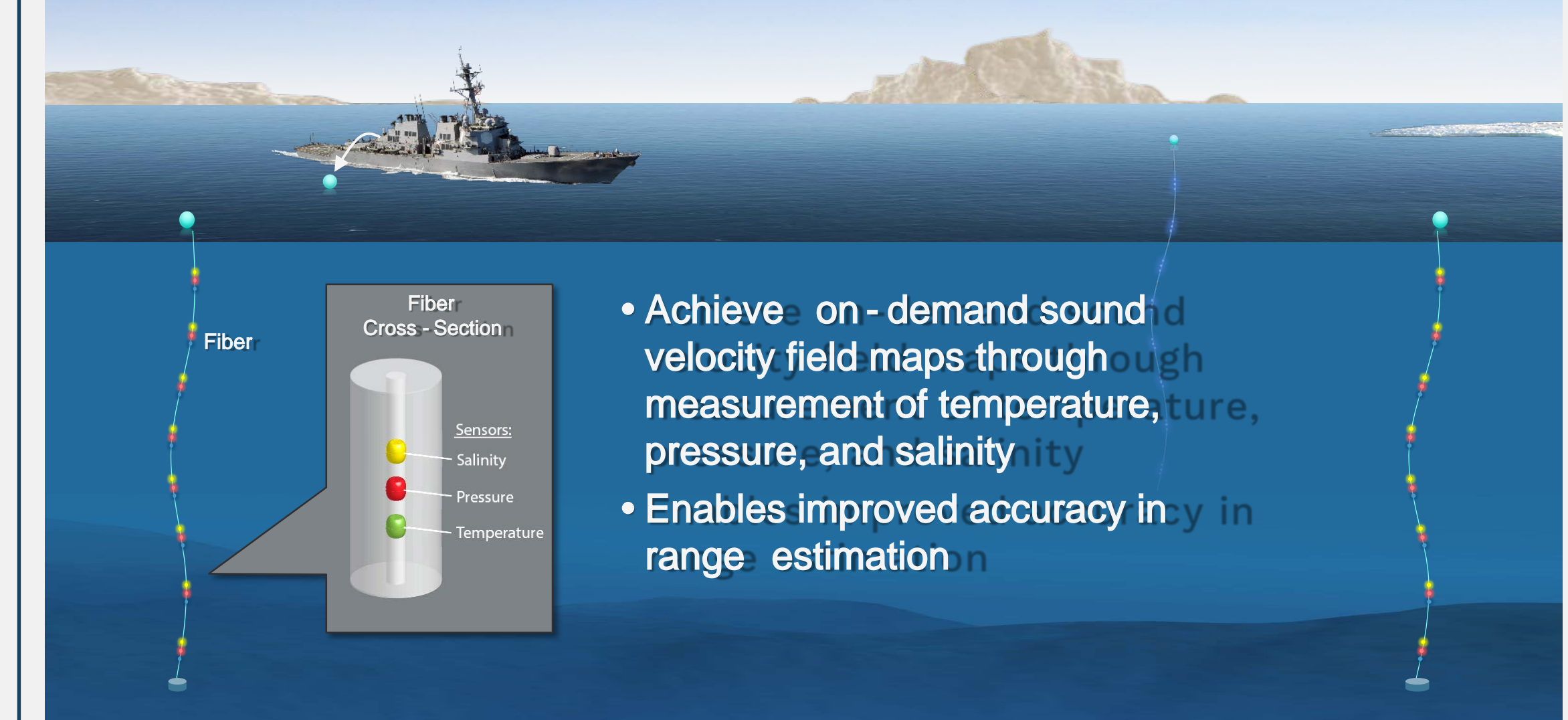
Expand to 4 integrated wires to allow both power and sensor data transmission



Impact

System Concept

Low - cost real time sound velocity mapping for optimizing undersea communication.

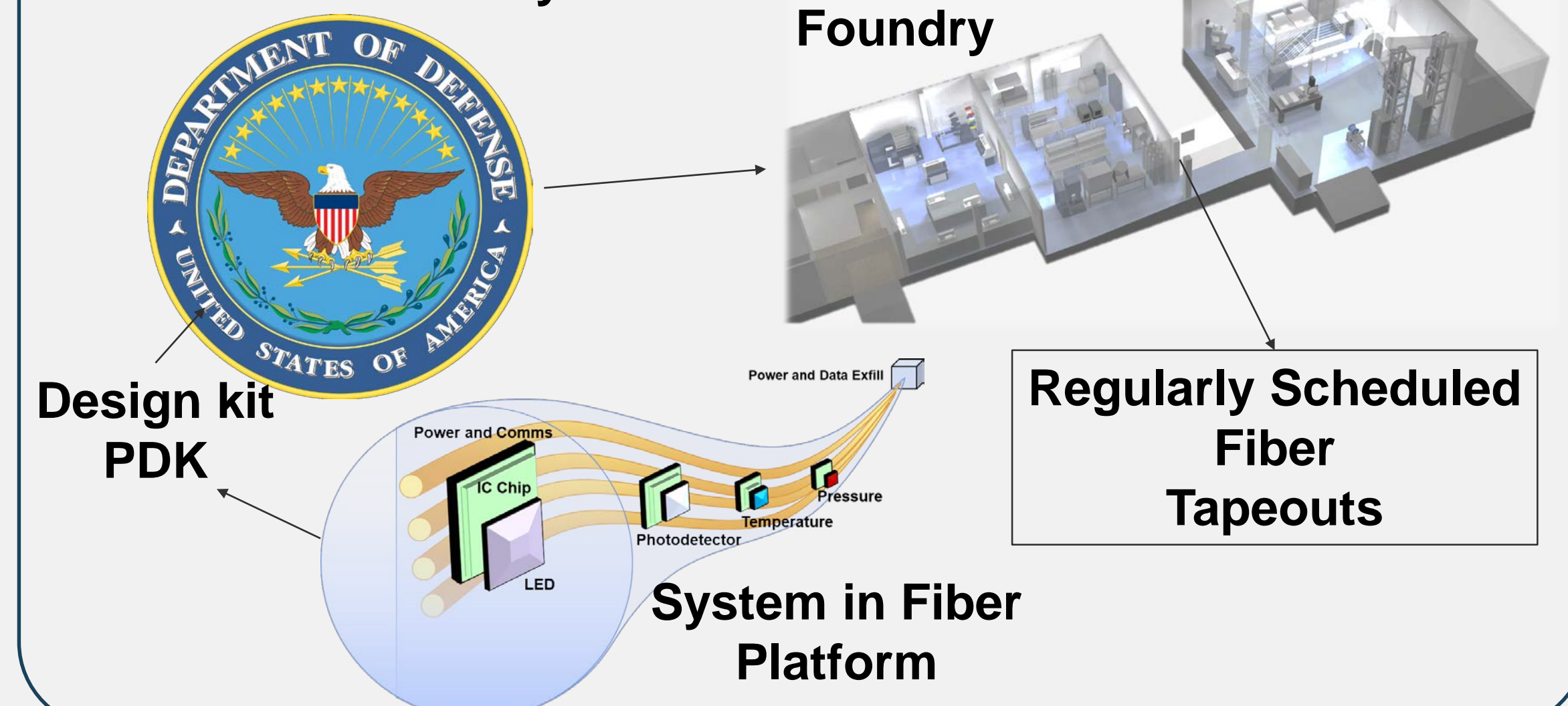


- Achieve on-demand sound velocity field maps throughout measurement of temperature, pressure, and salinity
- Enables improved accuracy in range estimation

Develop an advanced system-in-fiber platform to offer foundry service to the defense and commercial communities, aiding adoption of advanced fiber technology for defense system applications

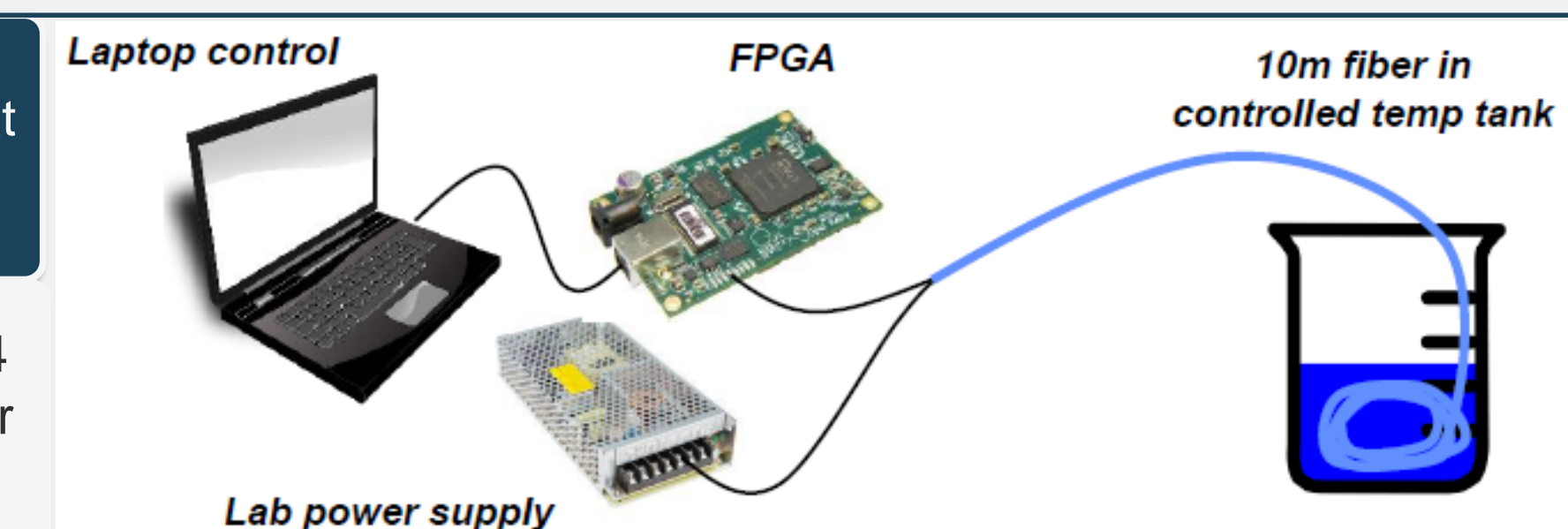
Defense Community

Fiber Microelectronics Foundry



Initial Fiber Demo at 9 months

10 m fiber with 4 temperature sensor nodes



Final Fiber Demo at 18 months

100 m fiber with 50 temperature sensor nodes

