



## All-Optical Nano-Positioner

### Applications

- Nanopositioning of fiber tip based devices
- Photonic circuits

### Problem & Solution

Piezoelectric transducers (PZTs) have been used to control the movement of objects in three dimensions with sub-nanometer precision and repeatability over micron scale ranges. Specifically, atomic force microscopy (AFM) uses PZTs to create submicroscopic images of almost any material imaginable. PZTs are also used to push nano-sized objects around for the purpose of constructing more complex features using AFM. However, problems of PZTs include complex materials construction and use of undesirable materials such as lead.

A better means of achieving nanometer scale tunable positioning by taking advantage of thermal-mechanical effects arising from a unique microsphere stem fabrication, external laser heating and thermal expansion in a single mode optical fiber has been developed. With this system, positioning of a tip can be controlled optically with nanometer resolution thus stepping towards an integrated all opto-mechanical system.

Our fiber based nano-positioner could be used to move any structure fabricated on the taper fiber tip such as plasmonic devices or AFM (Atomic Force Microscopy) tips.

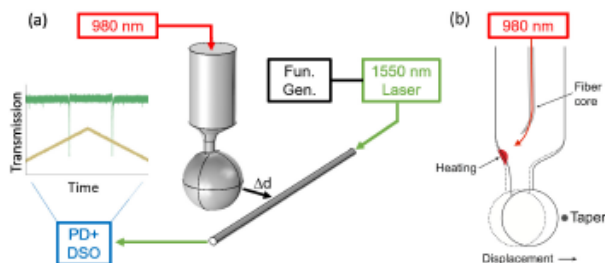
### Keywords

Opto-mechanical, Nano-positioning, All optical coupling, Microresonator, Waveguide.

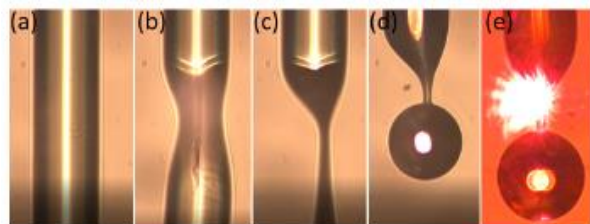
### For more information

Business Development/Technology Licensing Section

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A novel experimental set-up used to characterize the tunable thermal-mechanical coupling. The deformation of the fiber during fabrication redirects the incident laser light towards the stem. Once the stem region is exposed to laser light, the coupling distance between the microsphere and fiber can be manipulated.



Asymmetric stem fabrication method illustrating the initial state of the optical fiber and then the asymmetry resulting from side heating with a laser.

### Benefits

- All optical nano-positioning
- Precise tuning capability
- Higher sensitivity

### Patent Granted