Upgrade of a Capillary puller

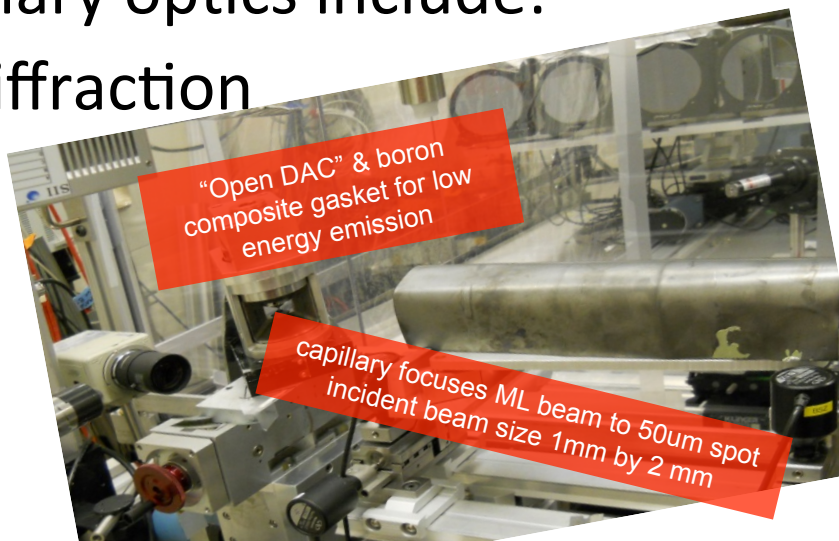
Eyonganyo Agbortogo

Rong Huang

Tom Szenbenyi

What is a Capillary Puller?

- Used to fabricate single bounce mono-capillary optics.
- These capillaries are used in experiments where small and concentrated x-ray micro-beams are needed.
- Most of CHESS micro-beams are made using mono-capillaries
- Examples of use of mono-capillary optics include:
- Micro-High Resolution X-ray Diffraction
- Micro-Protein Crystallography
- X-ray emission spectroscopy

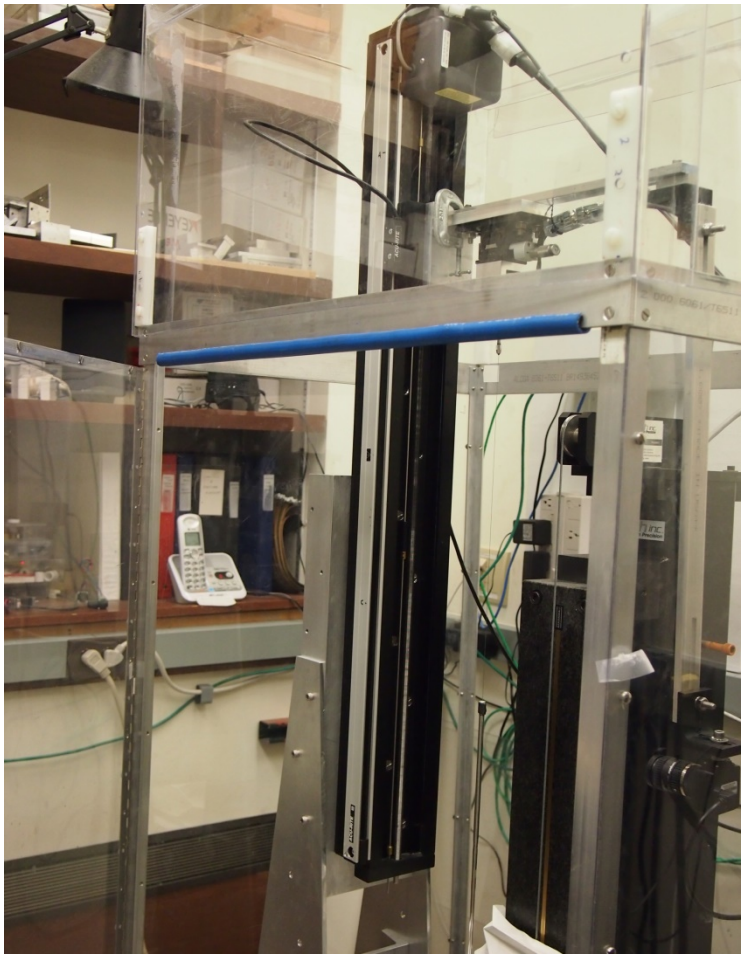


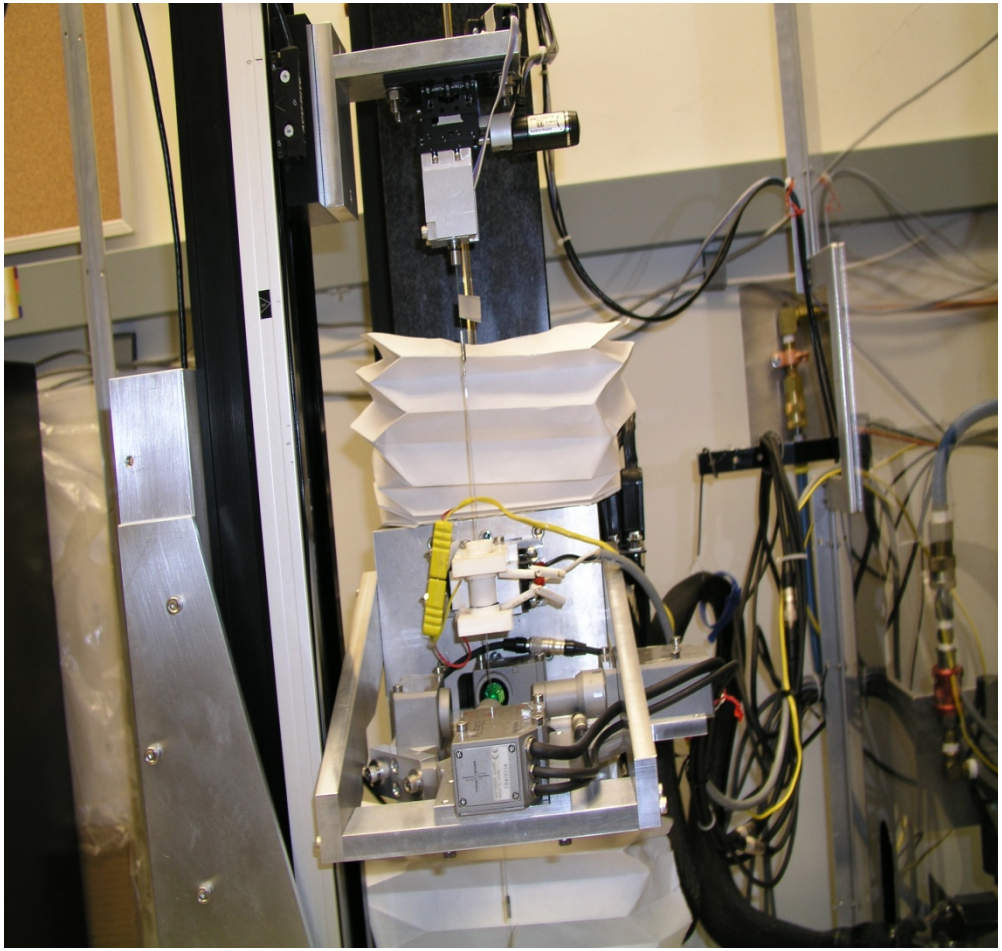
Capillary puller.

- Capillaries are produced by stretching a cylindrical piece of glass under constant tension and heat.

- This allows the capillary to be molded to the specified focus and divergence.

Capillary puller





Limitations of present Capillary puller.

- Has a resolution of only 1µm.
- Stage is not stiff causing vibrations to affect the constant tension pull on the capillary.
- Rotation of the glass during pulling causes non-uniform center-line.
- Uneven straightness of raw glass.

Upcoming modifications

- Installation of new Aerotech stage.
- Stage has better resolution of up to one-tenth µm.
- New stage reduces the straightness error from tens of microns to less than 10µm.
- Stage is robust and sits on a block of granite which will help reduce the vibrations during pull.
- Adjust rotation motors to reduce tension variations during pull.
- Modify pulling program to take into account the stiffness of glass and apply the corresponding tension.

New robust Aerotech stage.