Vibration Reduction in X-ray Capillary Optic Fabrication

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X-Ray Capillary Optics

• $\theta_c = 32 \text{ keV} / E_c \ast \text{ milliradians}$
Capillary Puller

Z (Tension) Stage

Air (Furnace) Stage

Capillary
Limits of Capillary Optics

• Ideal Capillary in ERL: ~10nm Spot Size
• Current Capillaries: ~10µm Spot Size

• Sources of Error
  – Slope Errors Presently 50-100 µrad rms
  – Profile Errors Presently 0.5-5 µm rms
Systematic Study of Vibrations

- Create a Controllable Vibration Source
- Make Baseline Measurements
- Improve Structural Design of Puller
- Make New Measurements

Before

After

One micron bar
Possible Methods to Mitigate Vibration

- Structural Crossbar
- Improved Capillary Mounting System
- Increase Mass of the Capillary Drawing Apparatus
Citations