

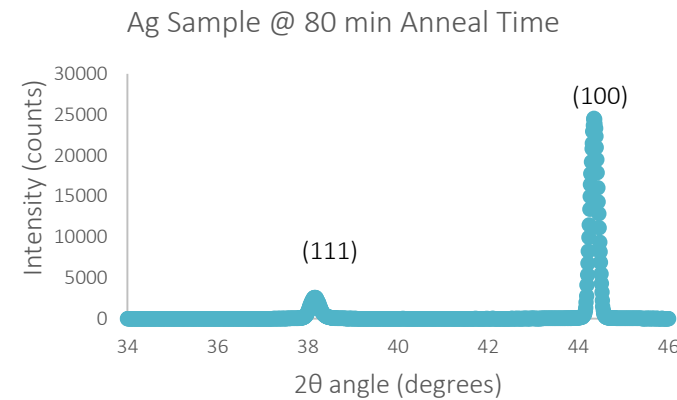
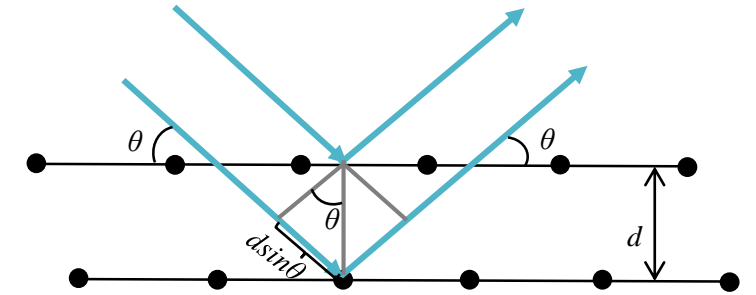
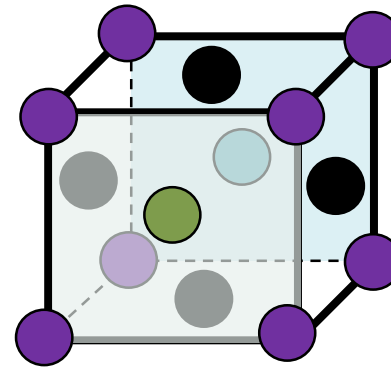
Modifications to the Houghton XRD

Sarah Olandt and Brandon Hoffman

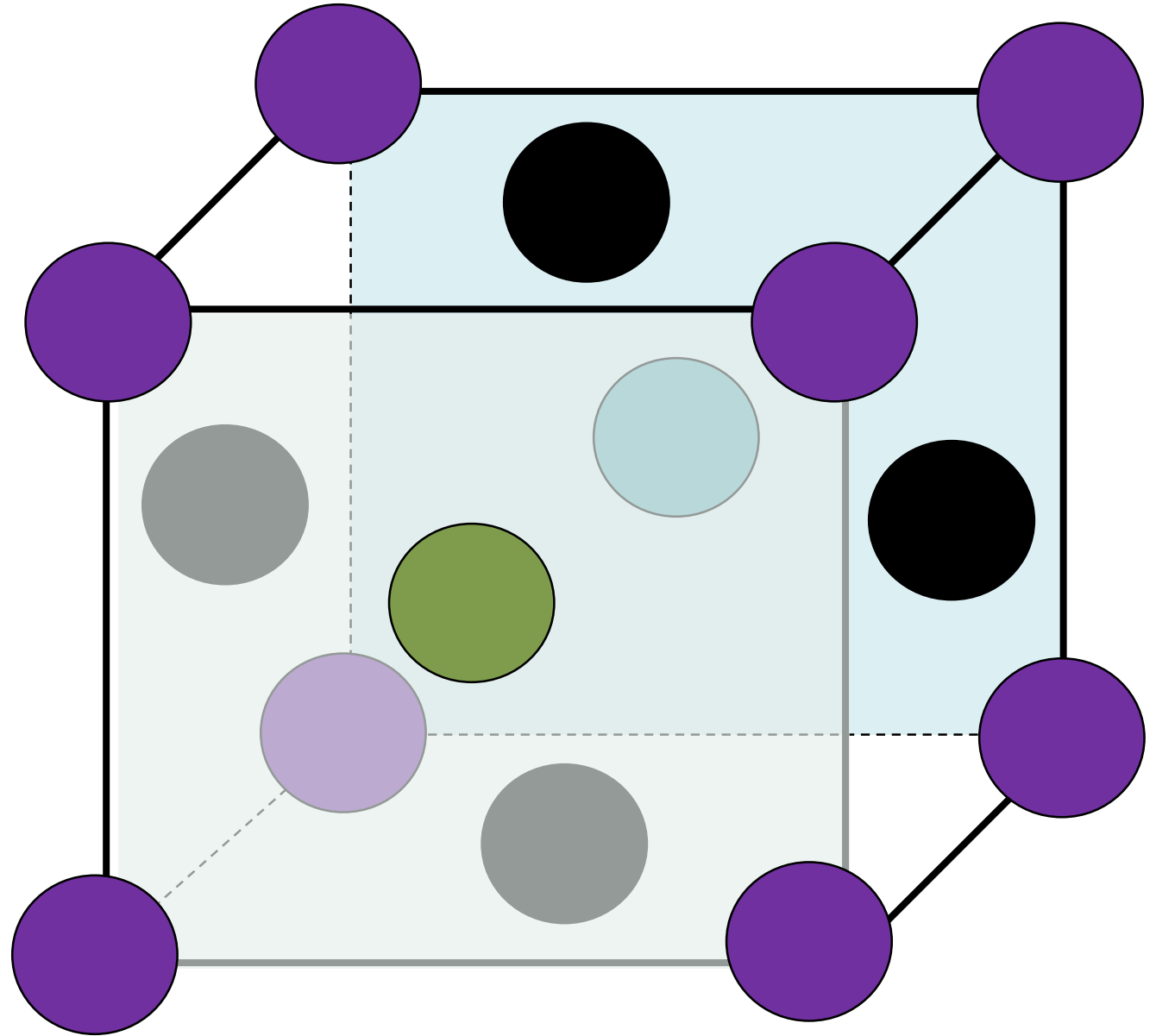
Department of Physics, Houghton College, One Willard Ave Houghton, NY 14744

Outline

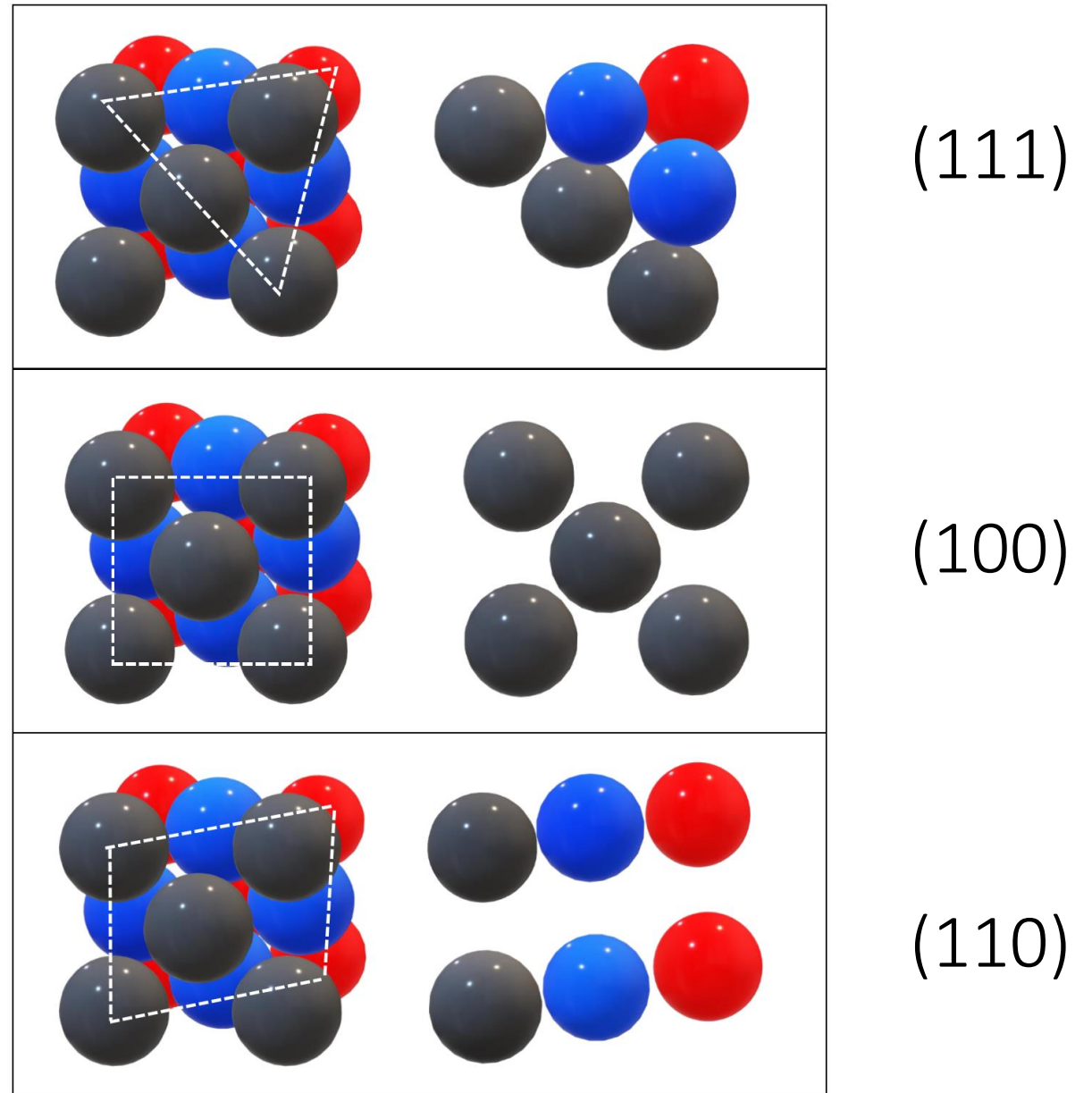
- Introducing Crystals
- Bragg's Law
- Interpreting XRD data
- Houghton's XRD
- Scans from the Houghton XRD
- Future plans



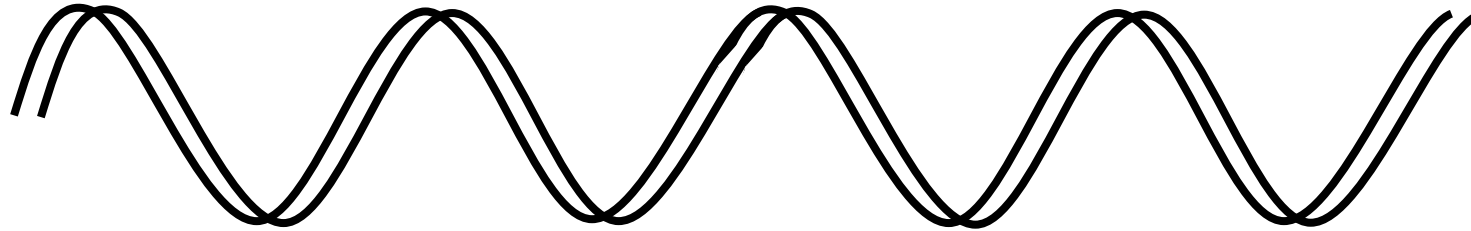
Crystal Structure



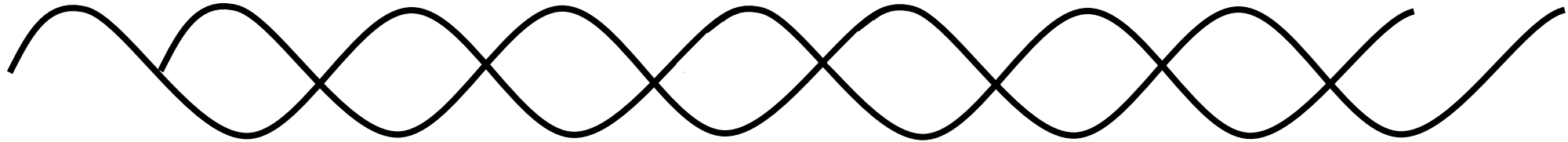
Crystal Orientations



Interference of X-rays

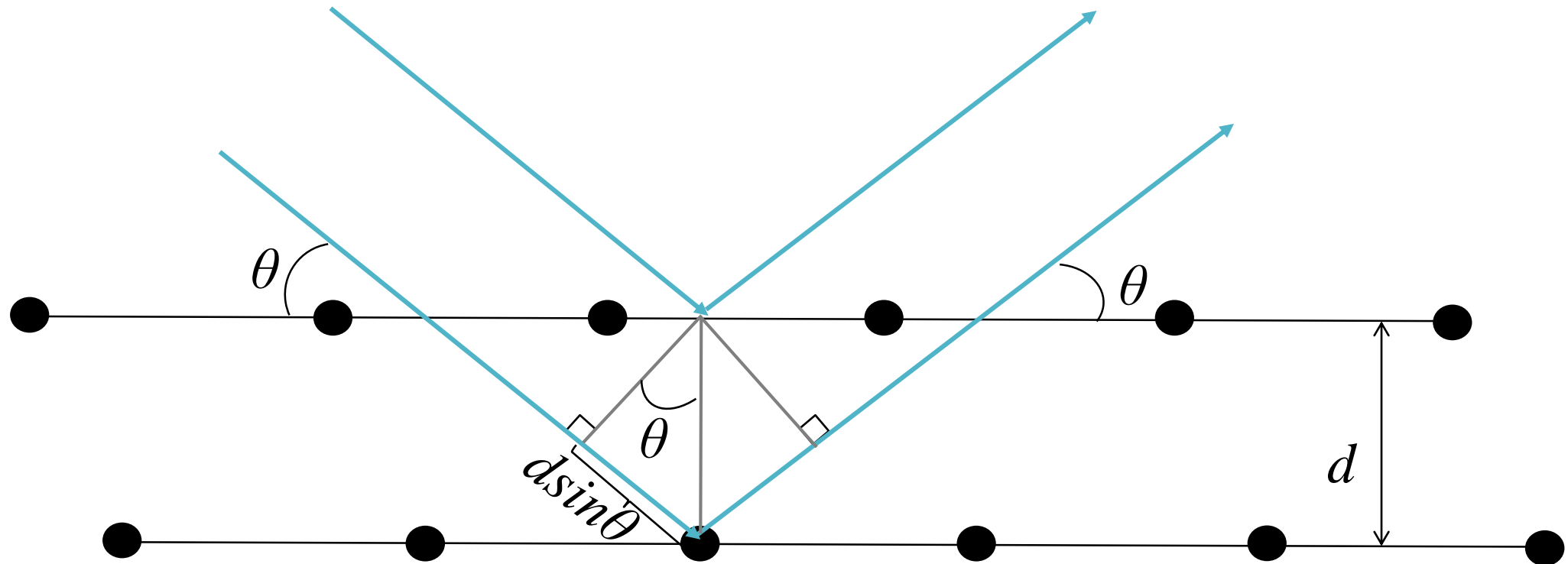


Constructive Interference → Amplitude increases



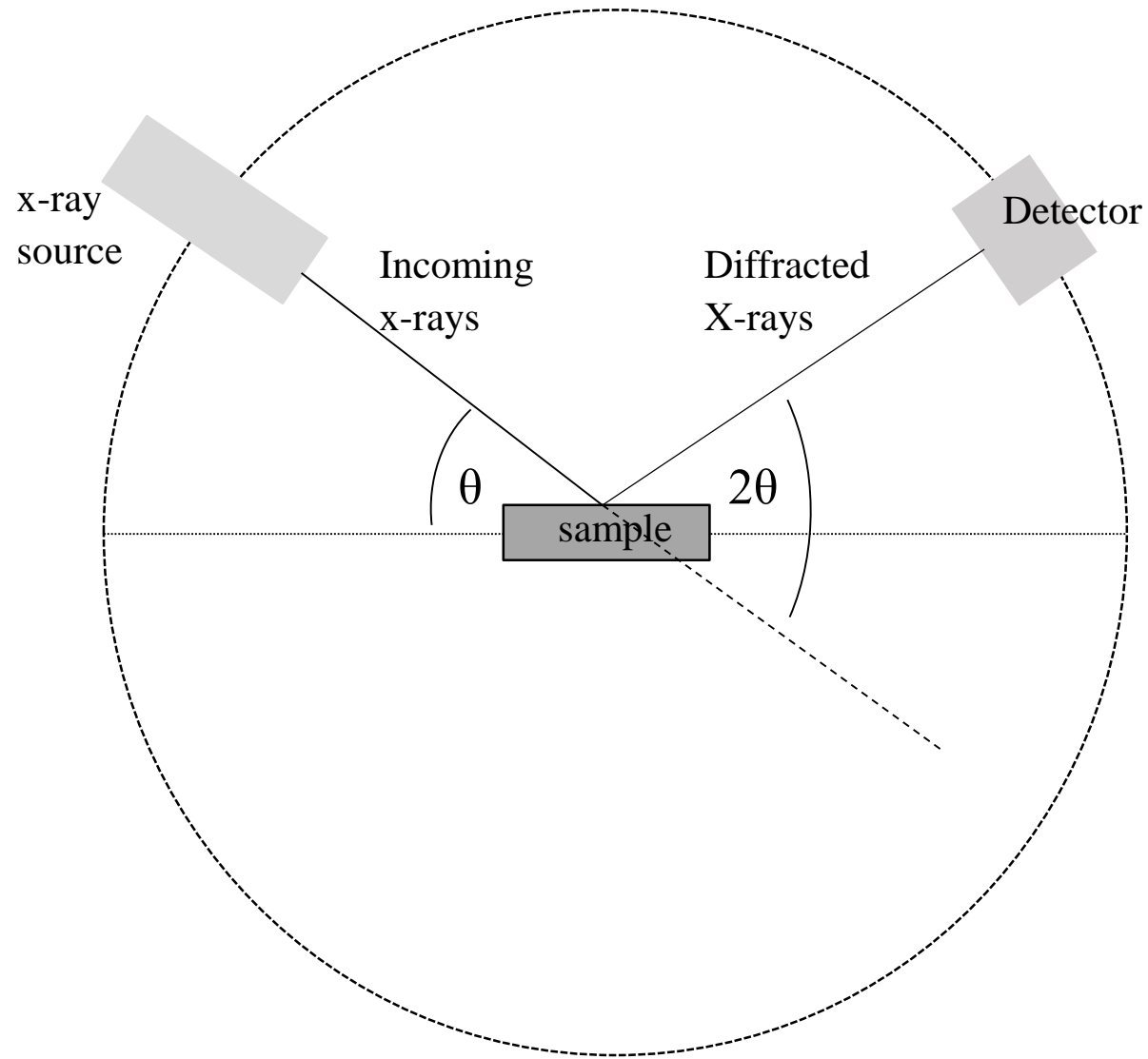
Destructive Interference → Amplitude decreases

Bragg's Law



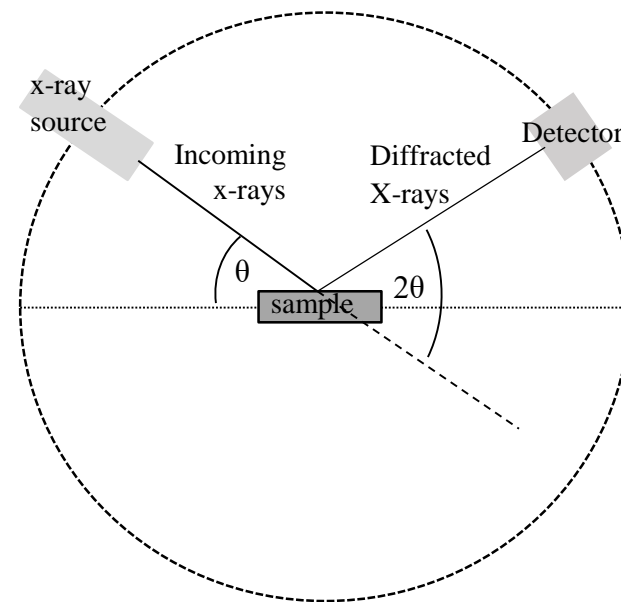
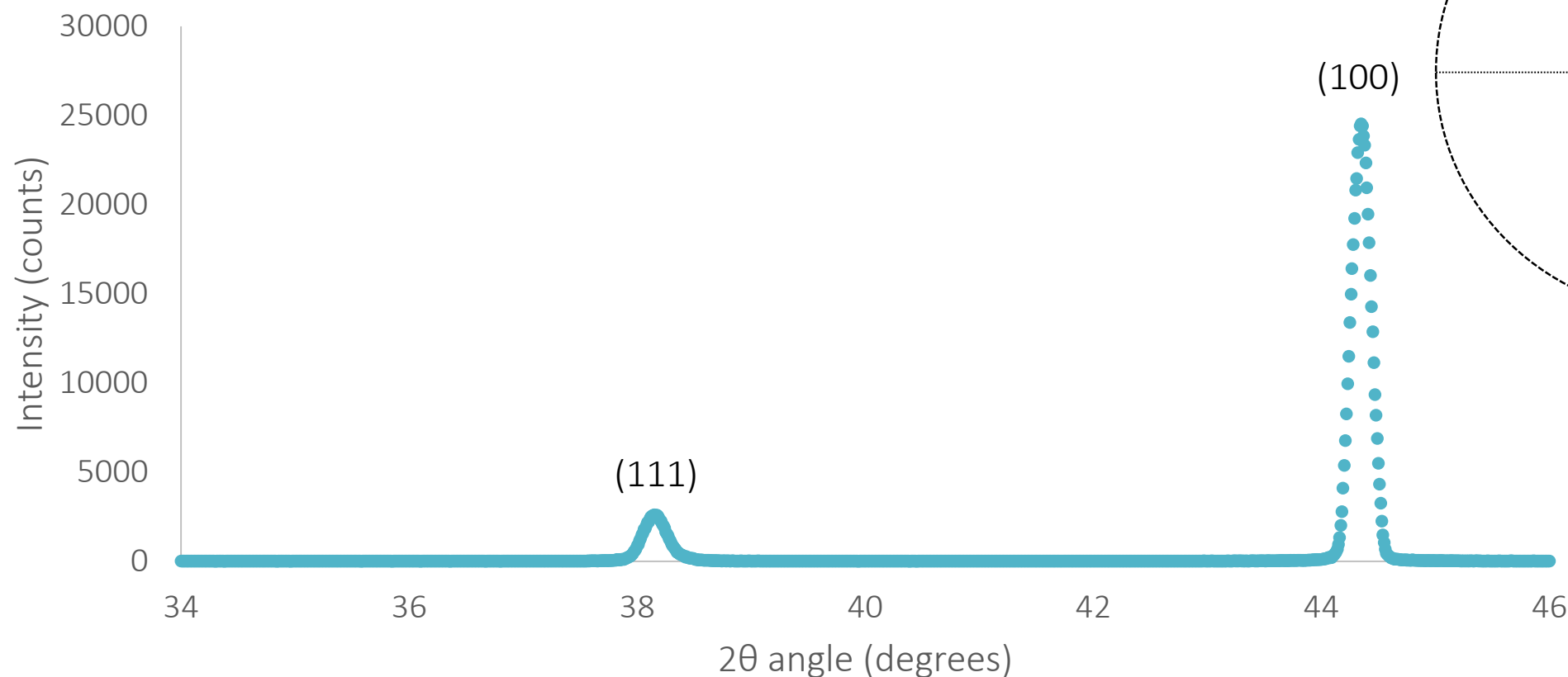
$$n\lambda = 2d \sin \theta$$

X-ray Diffraction in Thin Films



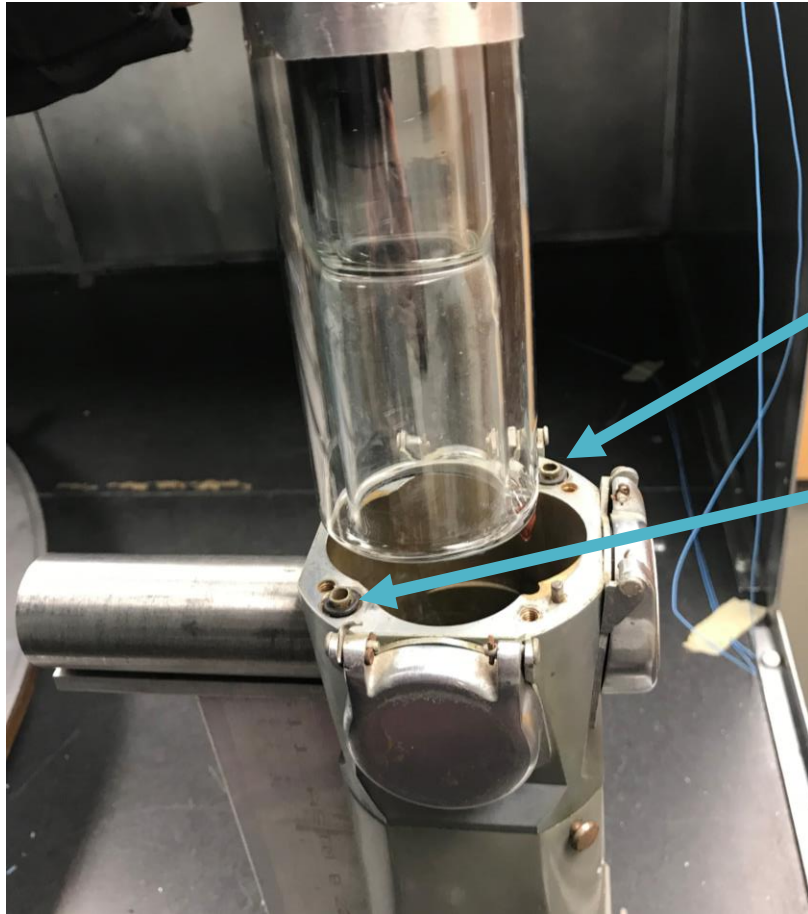
Interpreting XRD Scans

Ag Sample @ 80 min Anneal Time



*data collected in collaboration with Dr. Shefford Baker at Cornell University

Houghton's X-ray source

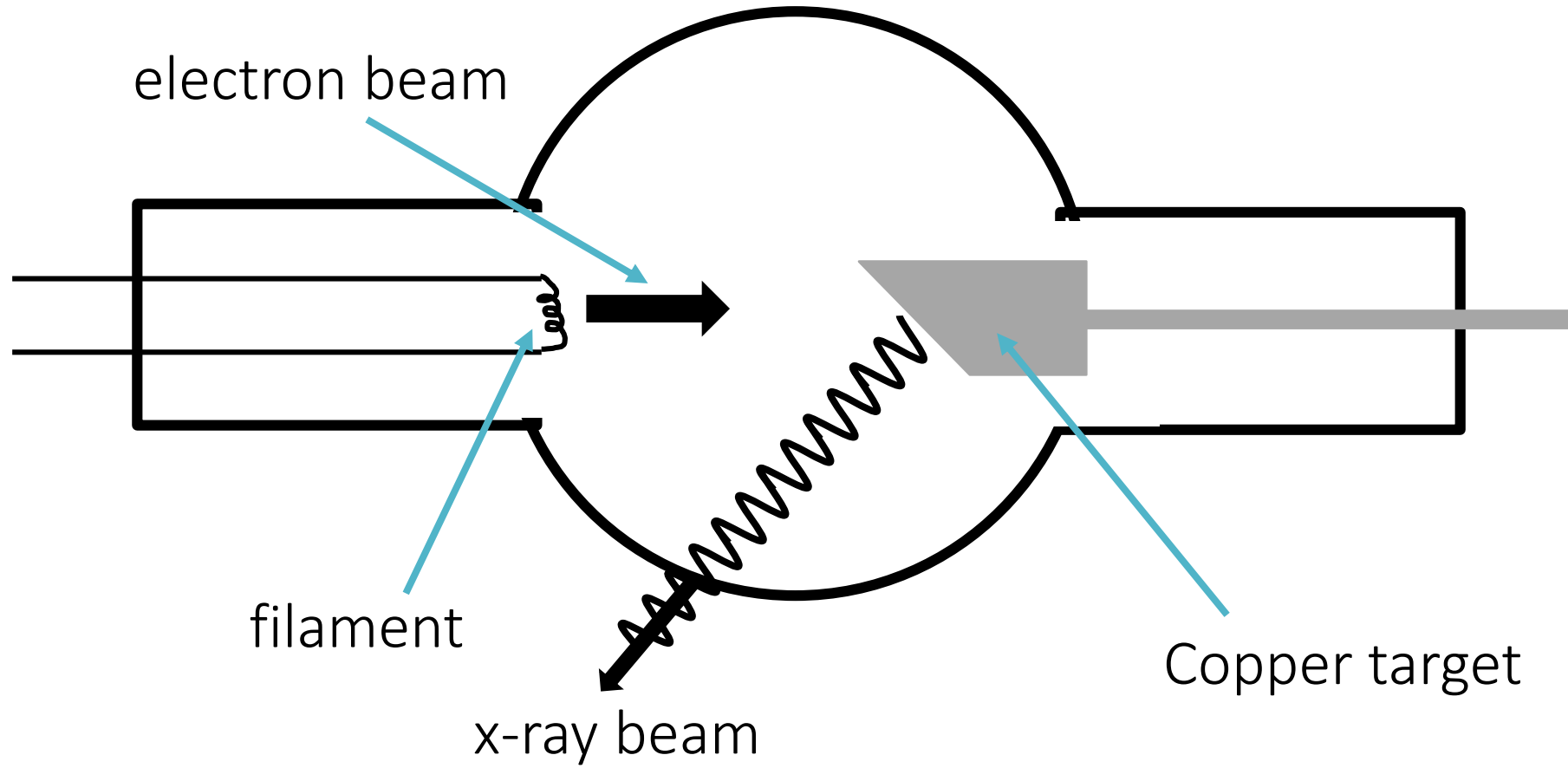


Water
cooling
connections

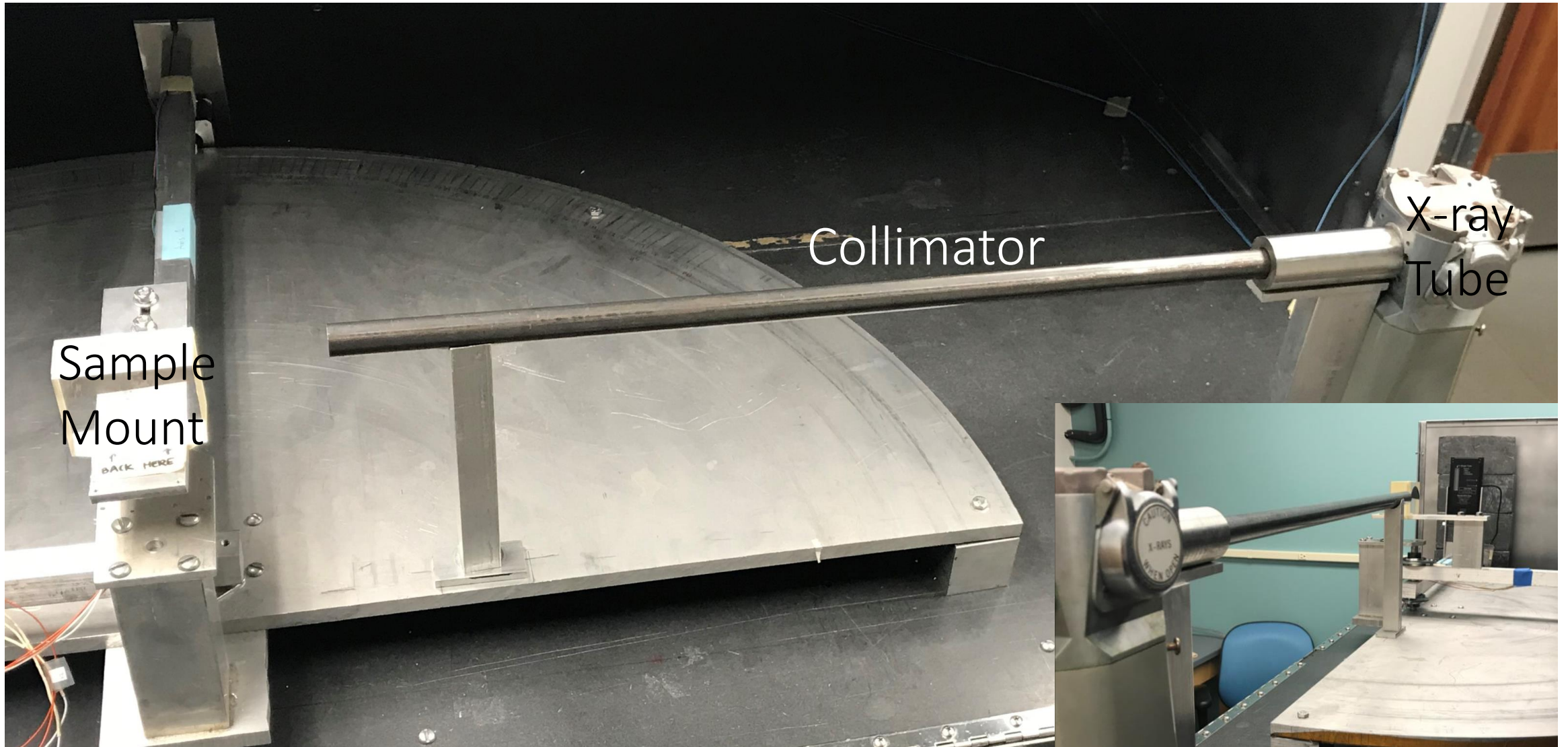


Copper –
X-ray
production
occurs here

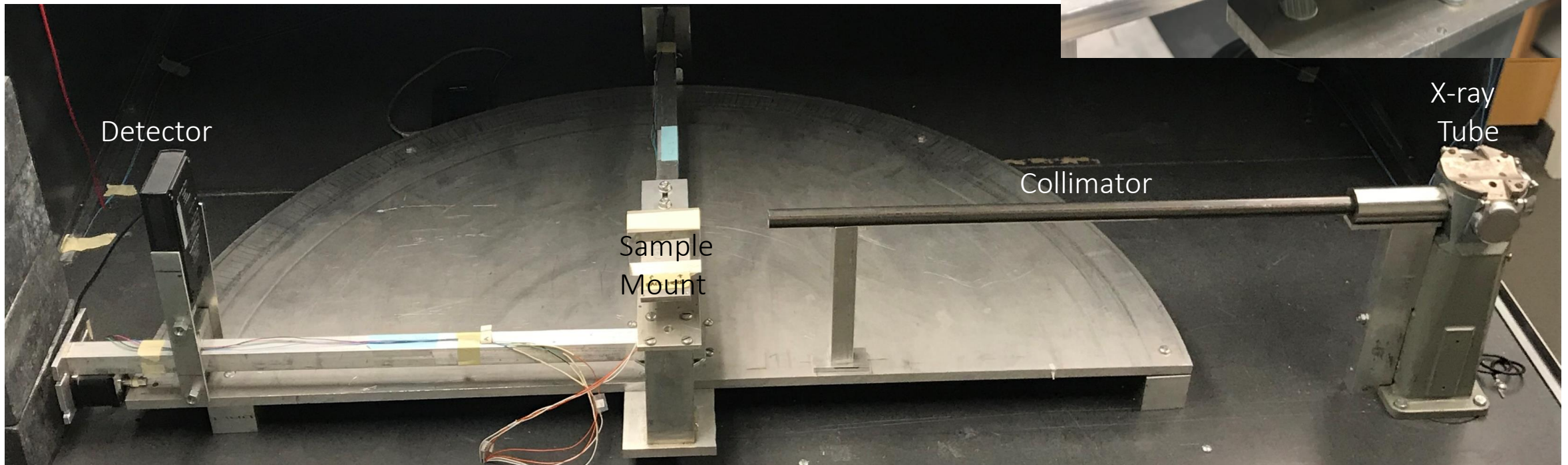
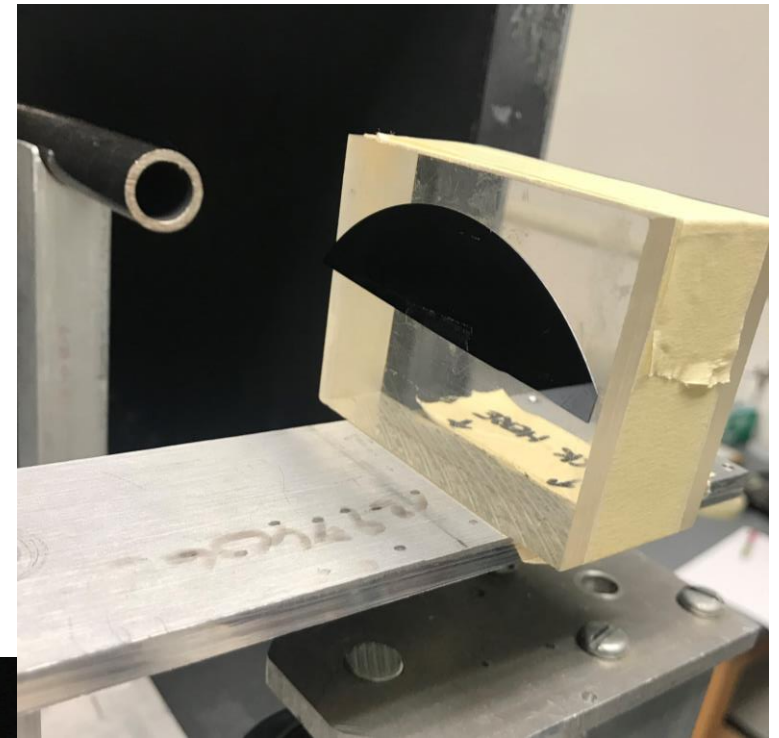
X-ray Production



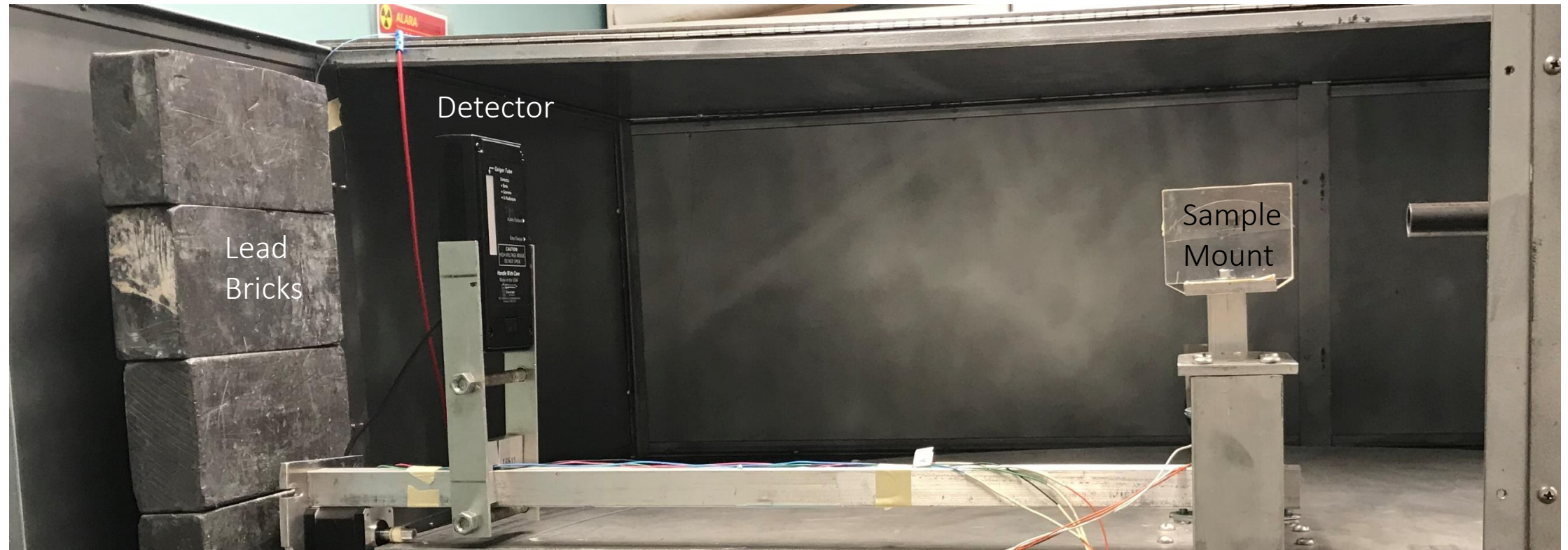
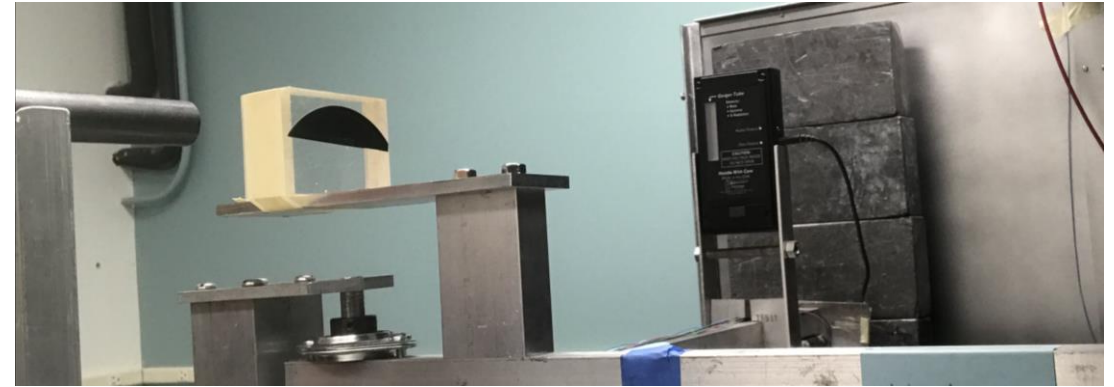
Collimator



Sample Mount

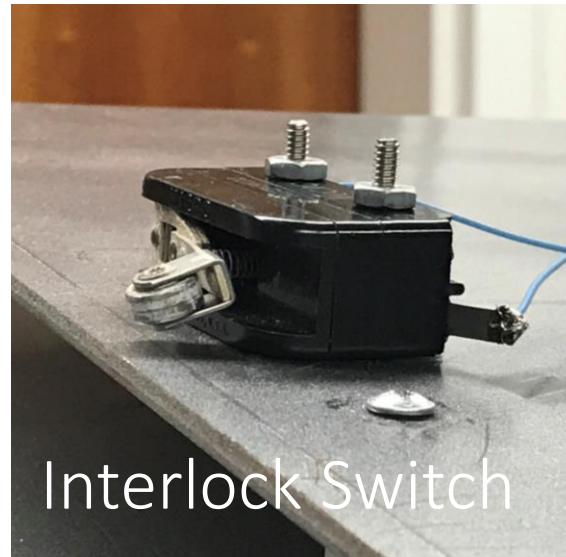
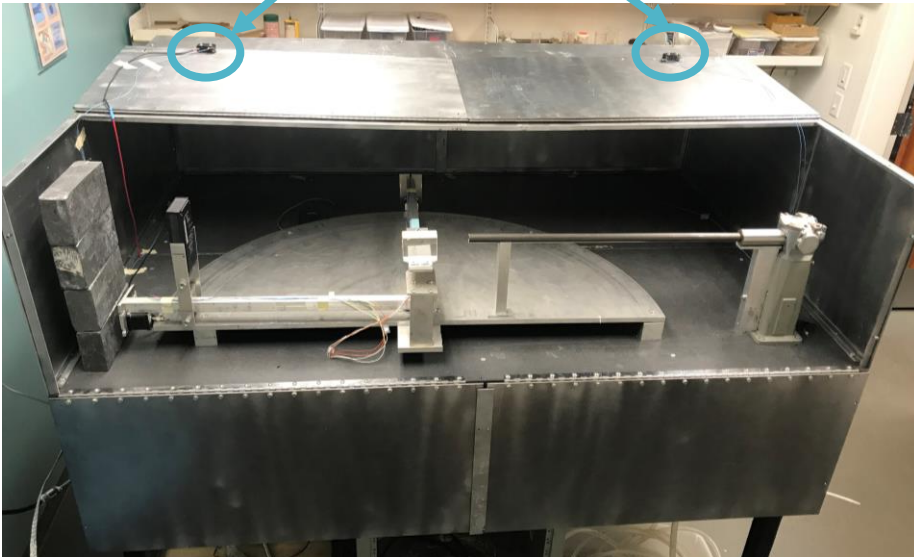


Reducing Errant X-rays



Shielding

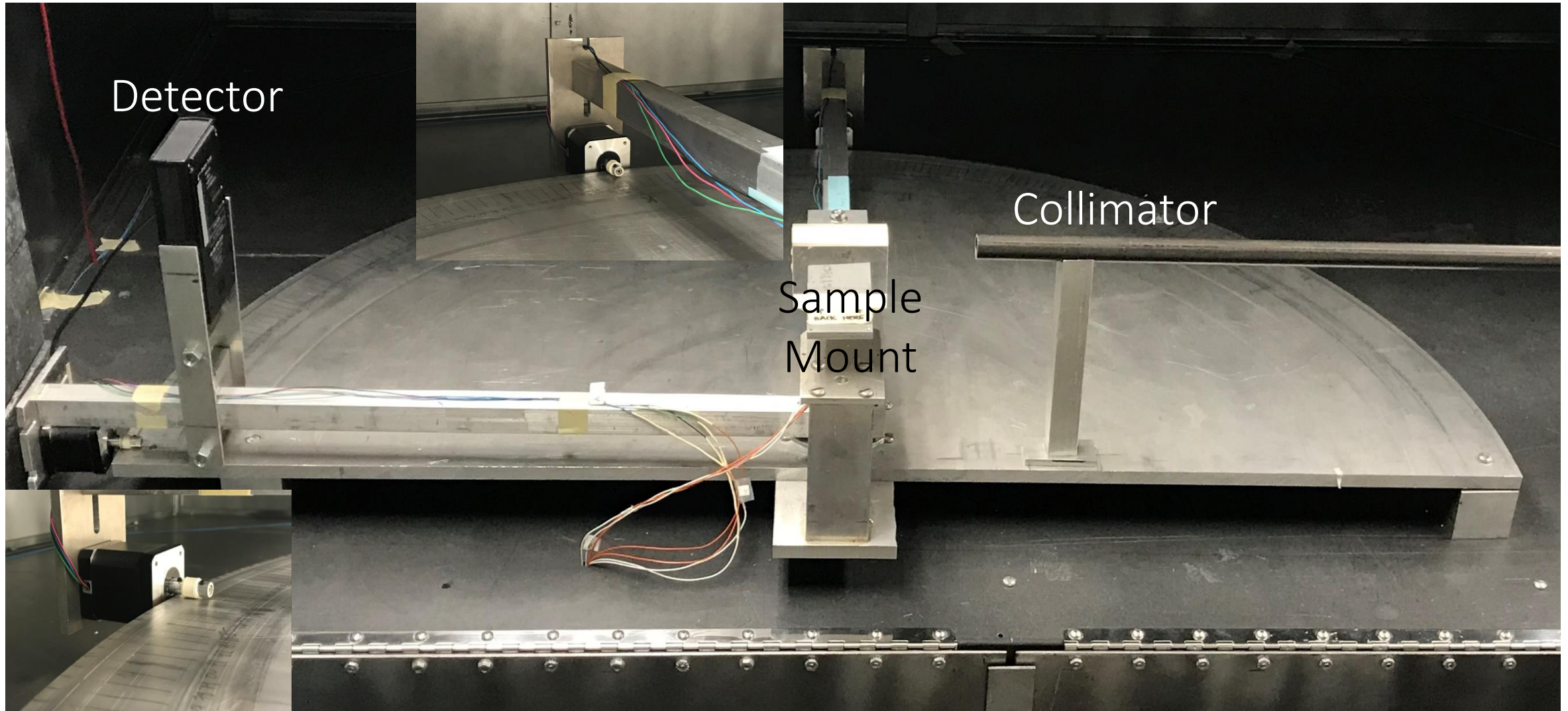
Interlock switches



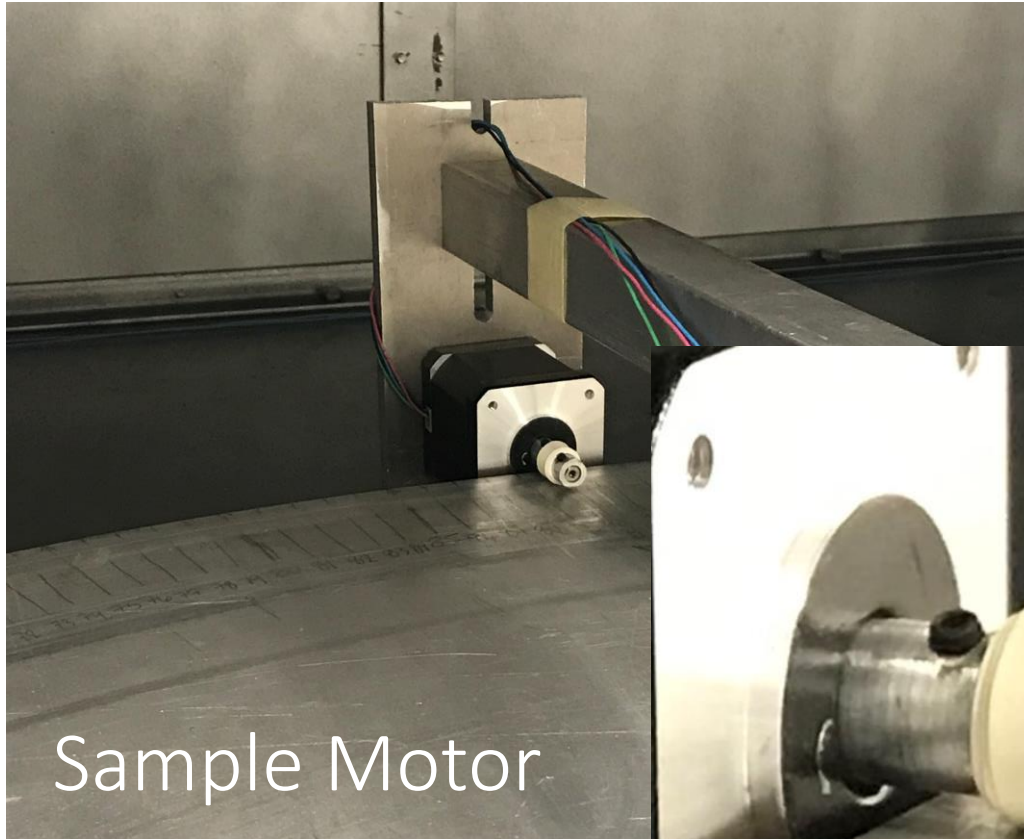
Interlock Switch



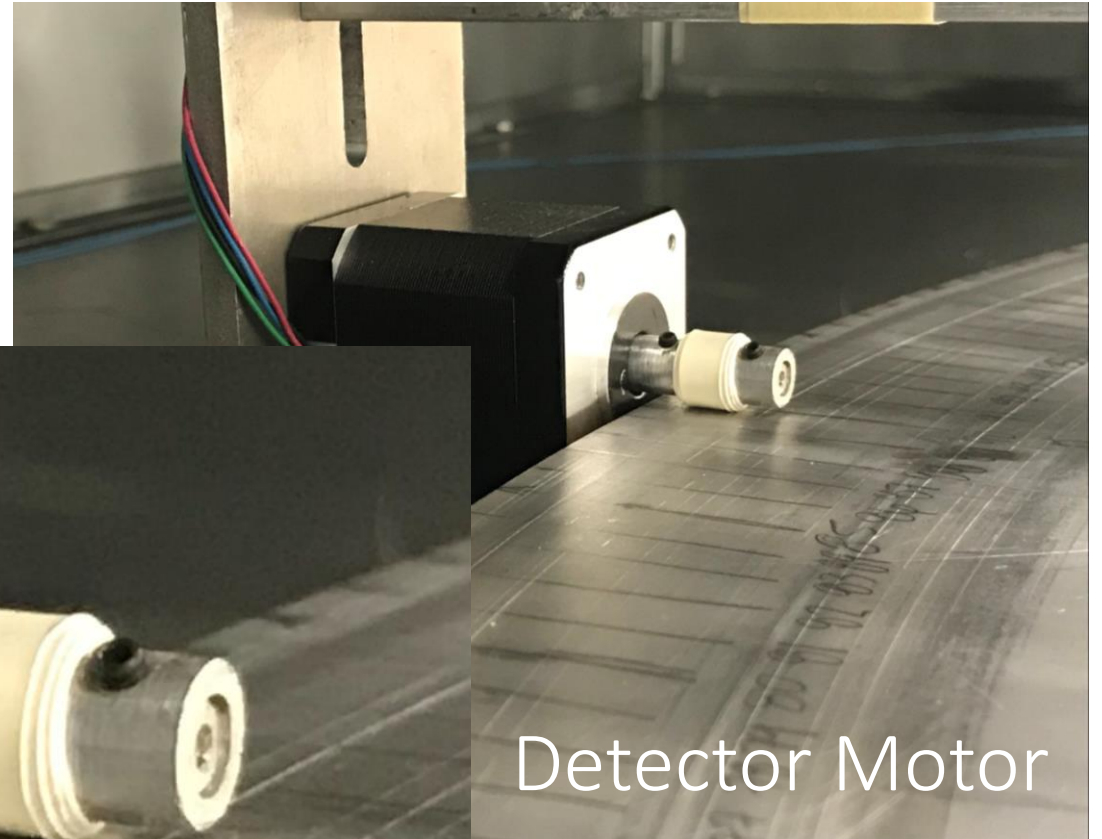
Varying Incident Angle



Motor Consistency



Sample Motor

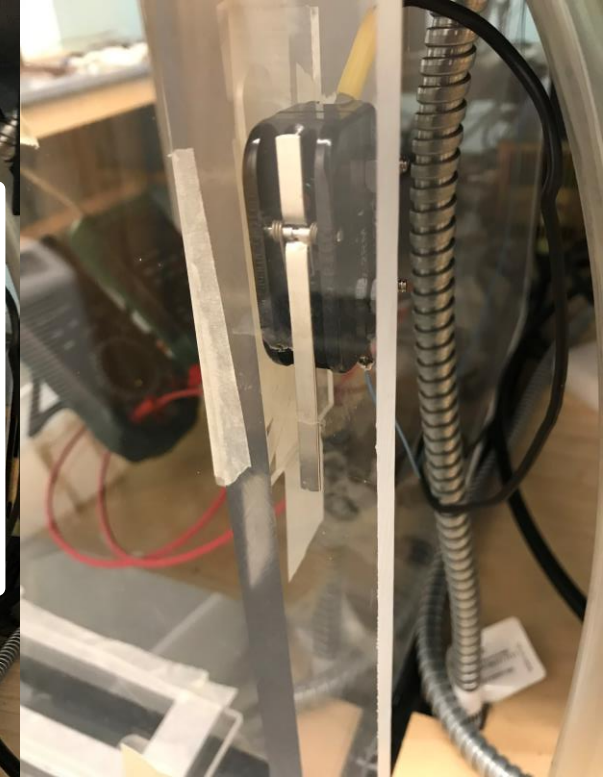
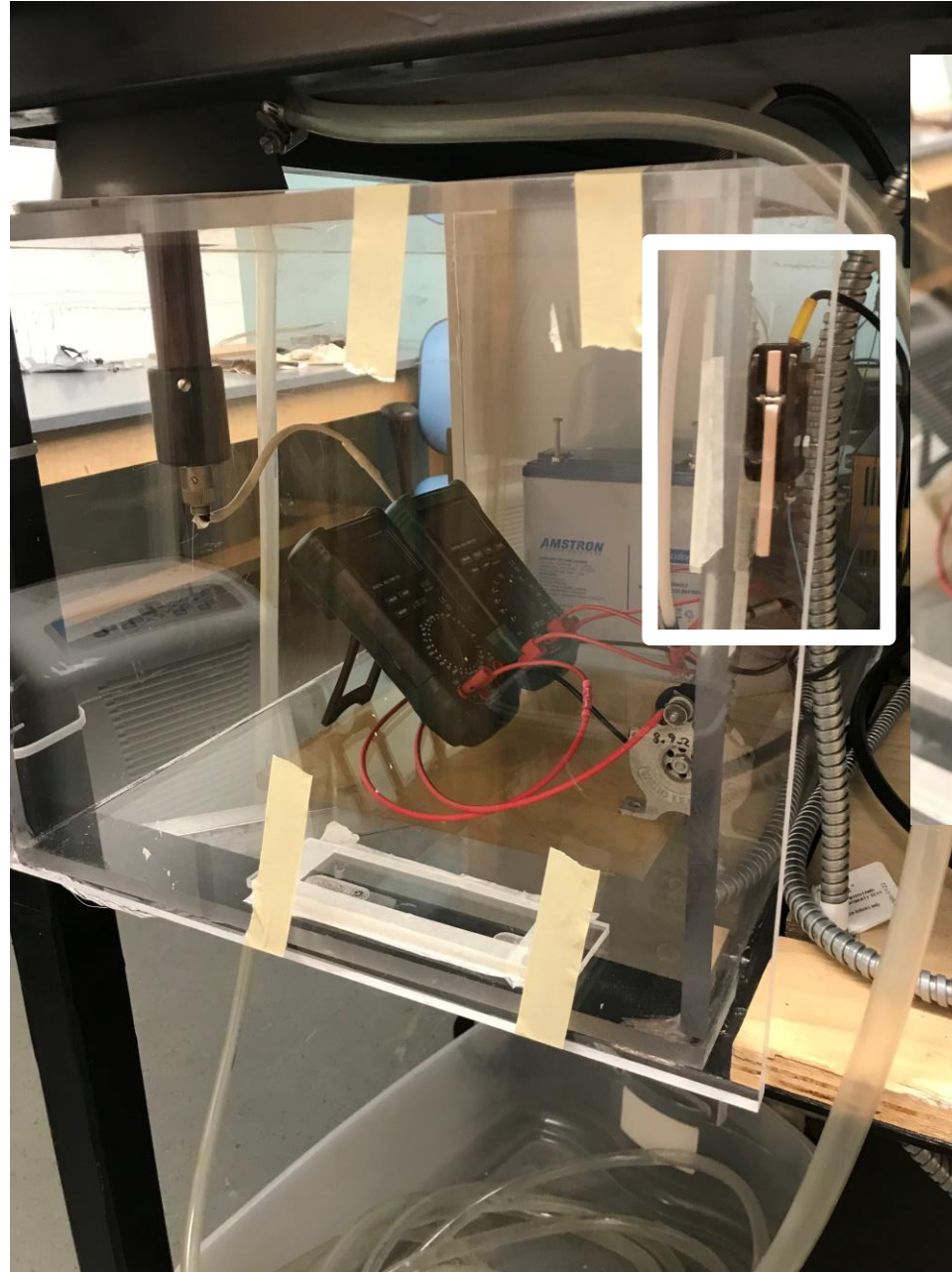


Detector Motor

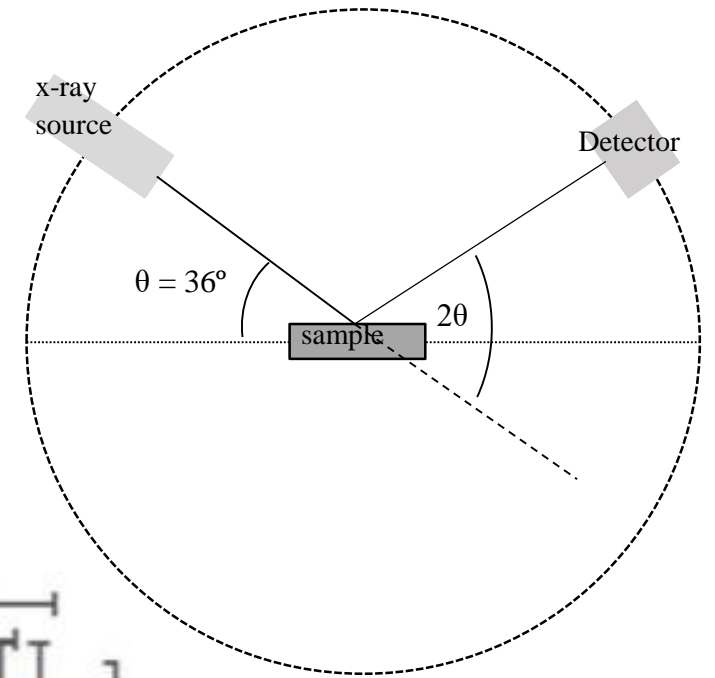
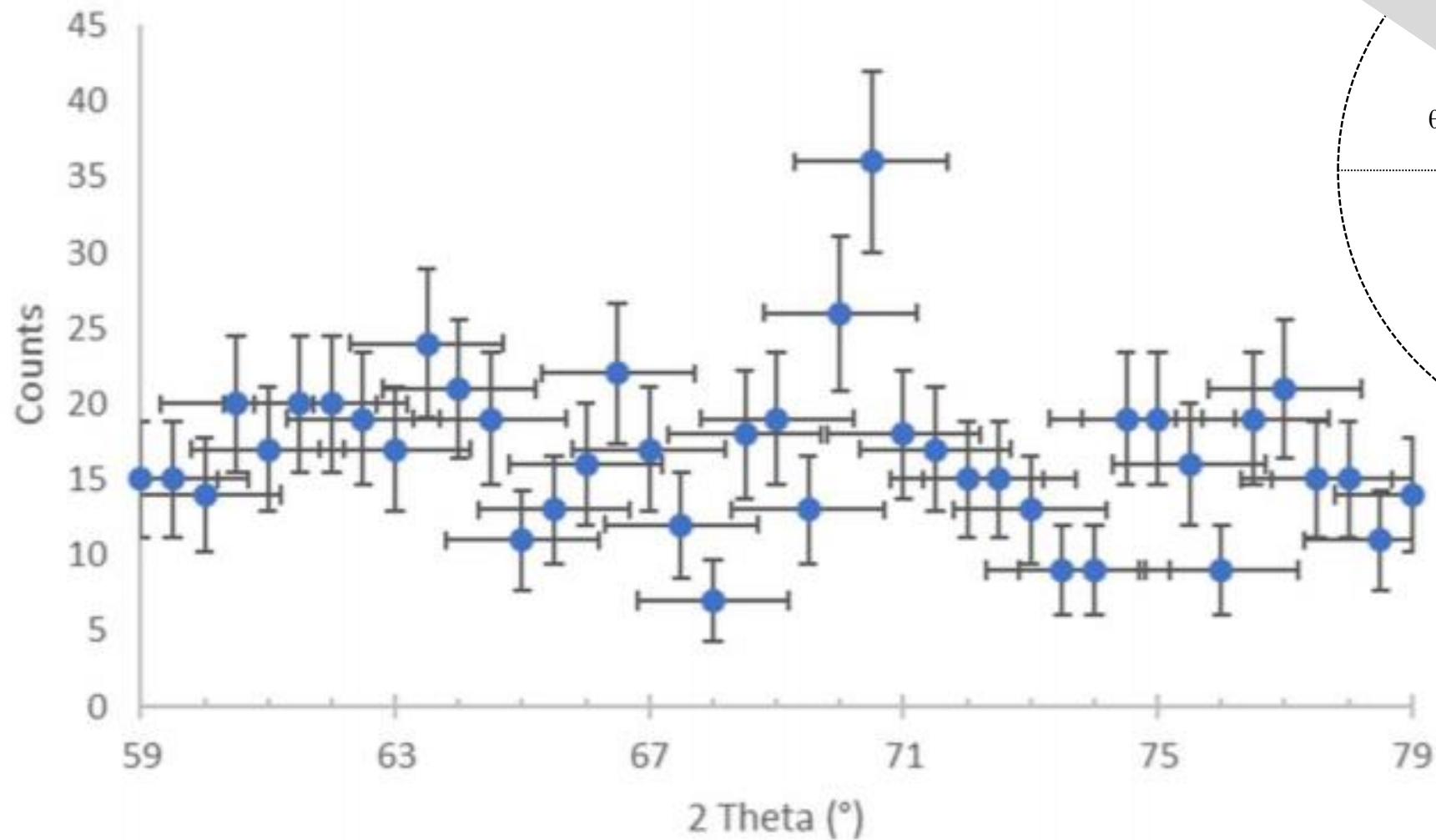


"wheel"

Extra Safety Features

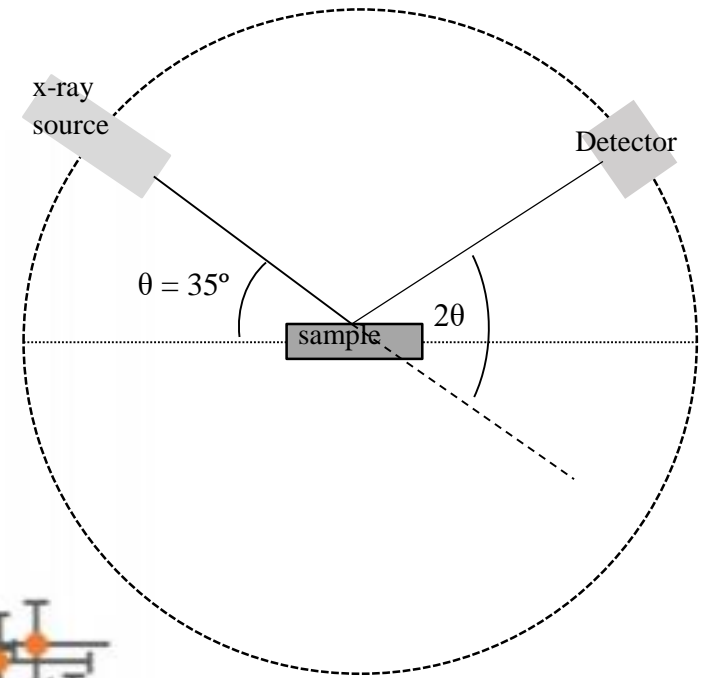
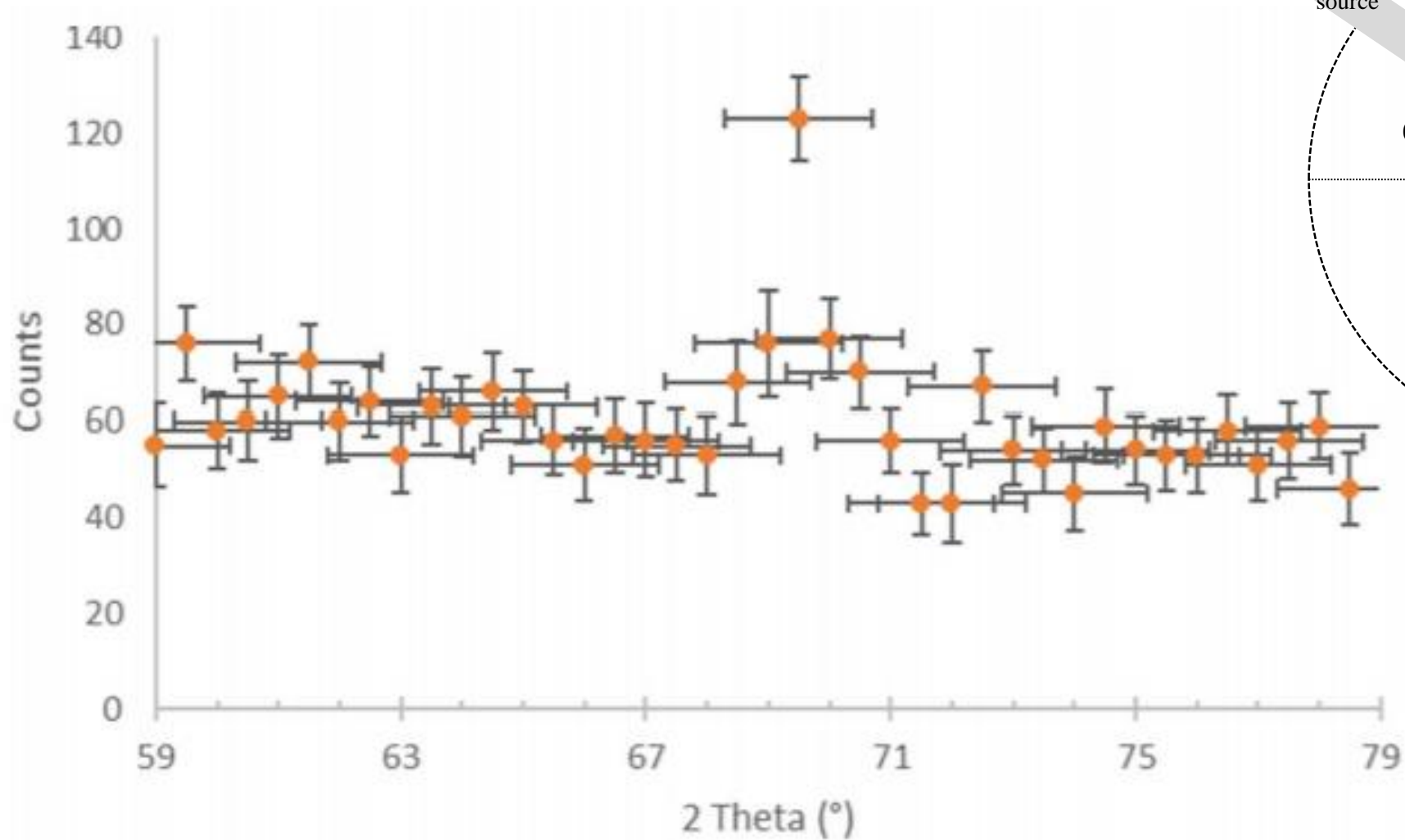


Results



*image taken from Heather Phillips's senior thesis (unpublished)

Results



*image taken from Heather Phillips's senior thesis (unpublished)

Future Plans for the Houghton XRD

- Improve sample mount
- Install better x-ray detector
- Cap end of collimator
- Analyze films