


# The Use of X-ray Free Electron Lasers in Shock Physics

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INT REU Program  
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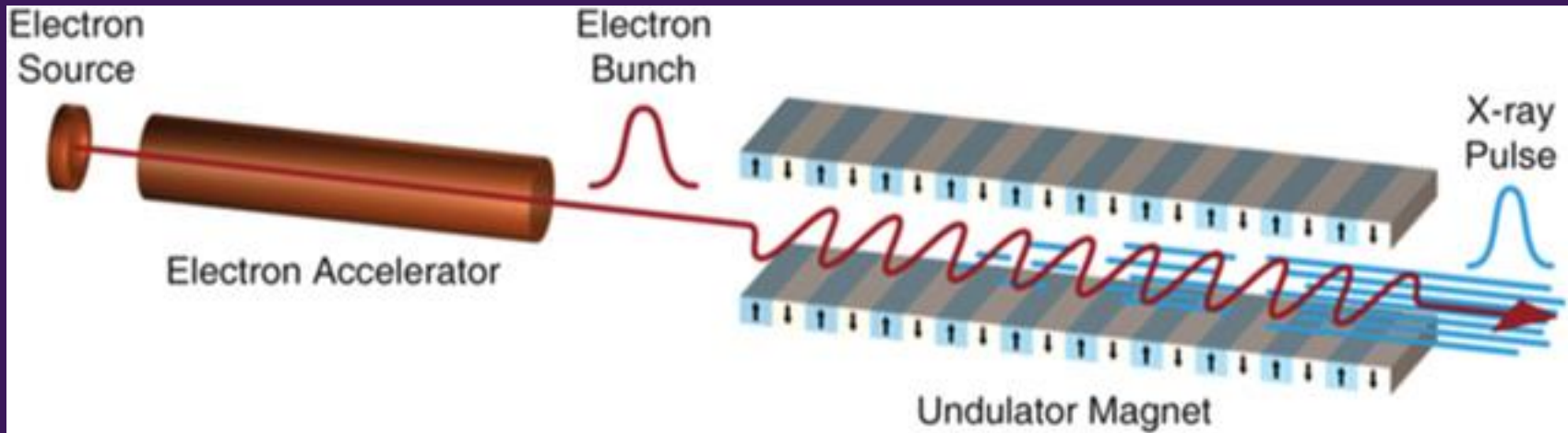
# Outline

- Motivation
- XFELs and Their Uses
  - Background
  - Previous APS Studies
- LCLS LP70
  - MEC Endstation
  - Sample Preparation
- UW MAF Analysis
  - XRD, SEM, Micro-Raman
- Future Work

# Motivation

- Carbon  Diamond
  - Meteor Impact
- Alloying Study
- Other Samples
  - Al Peening
  - Quartz Phase Transitions
  - Quasicrystal Formation

# X-ray Free Electron Laser

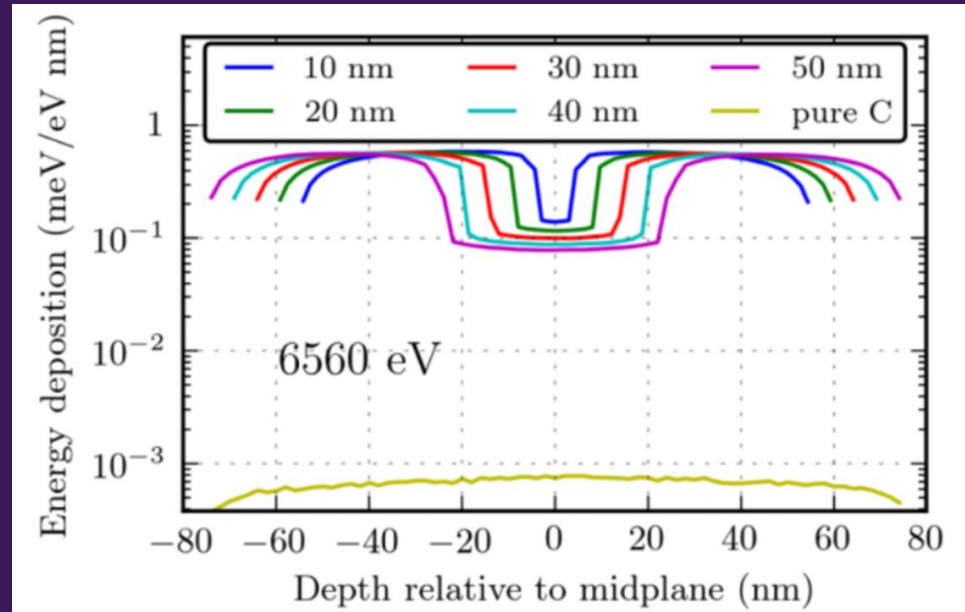


- Pump-Probe
- Making Solid Density Plasmas

# Previous APS Studies

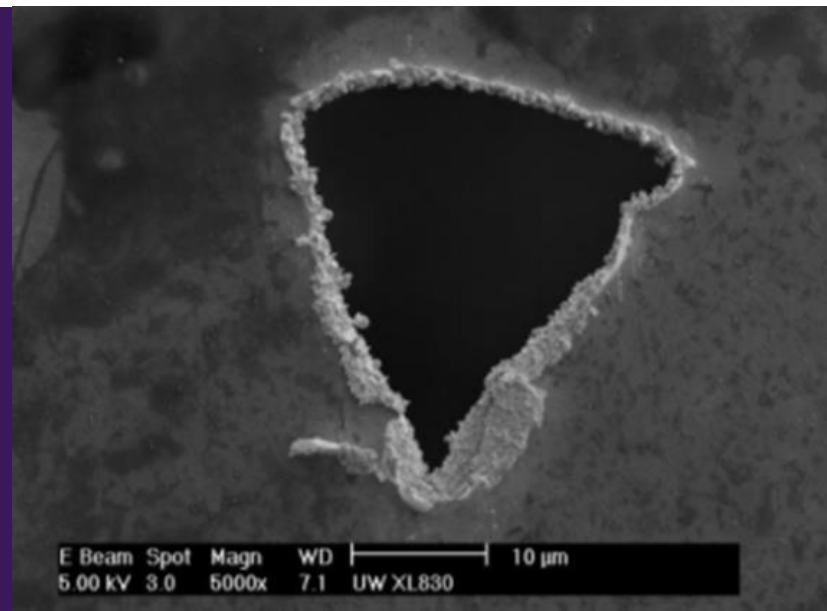
- Hot Electron Furnace
  - Au-C-Au

Hoidn, et. al., *Nonlocal Heat Transport and Improved Target Design for X-ray Heating Studies at X-ray Free Electron Lasers* (2016)

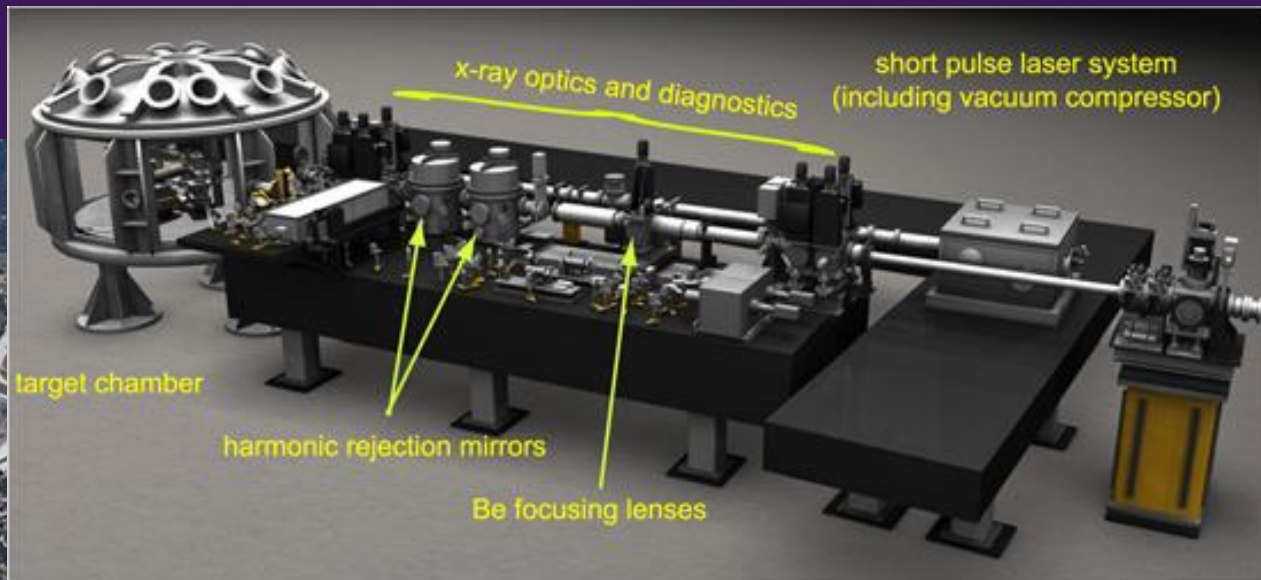
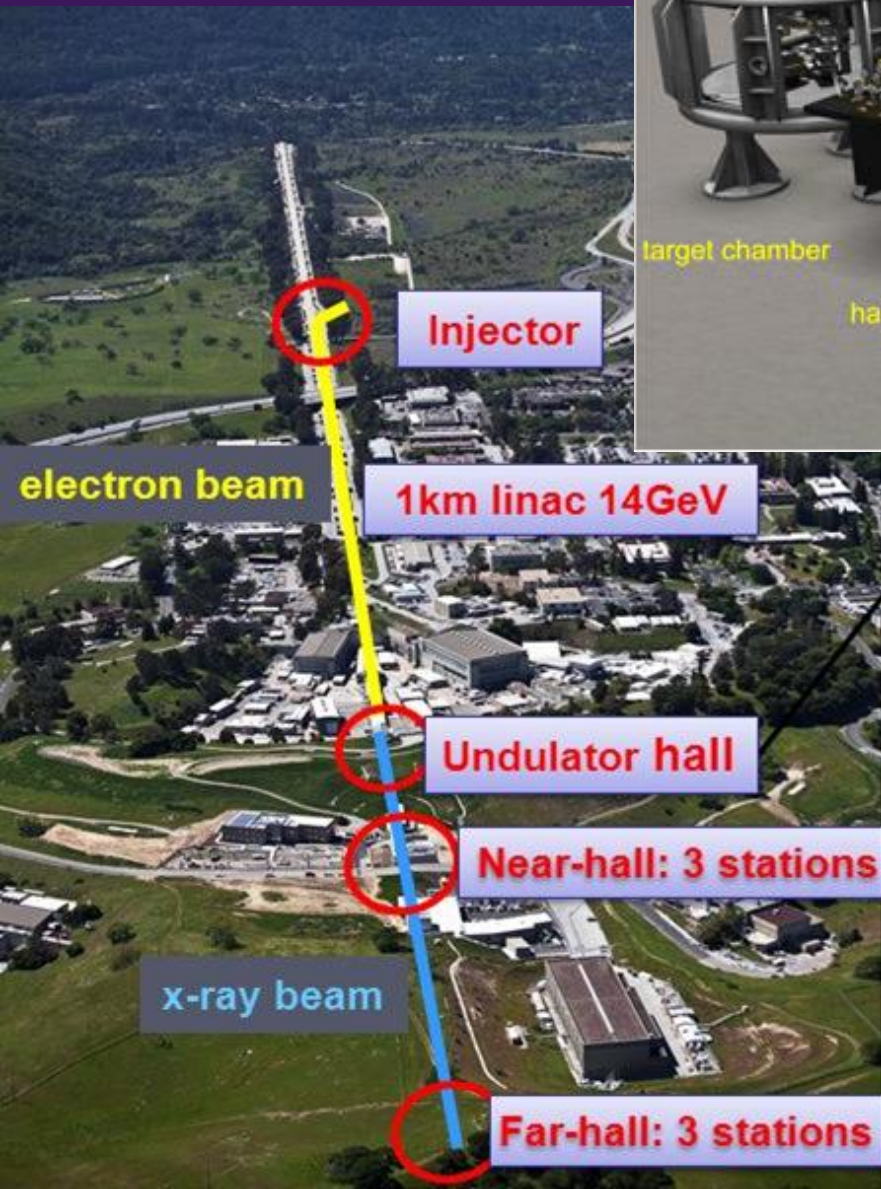


- Proof of Confinement Principle
  - Cu-Au-Cu

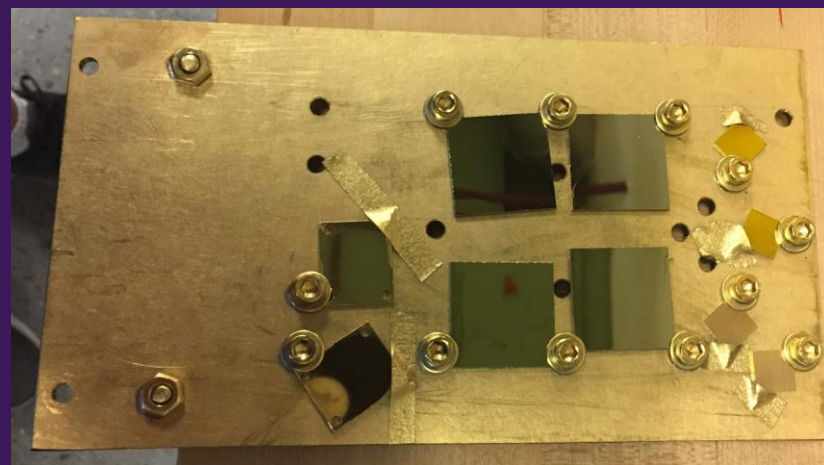
Valenza, et. al., *Synchrotron X-ray Heating and Target Confinement* (in prep)

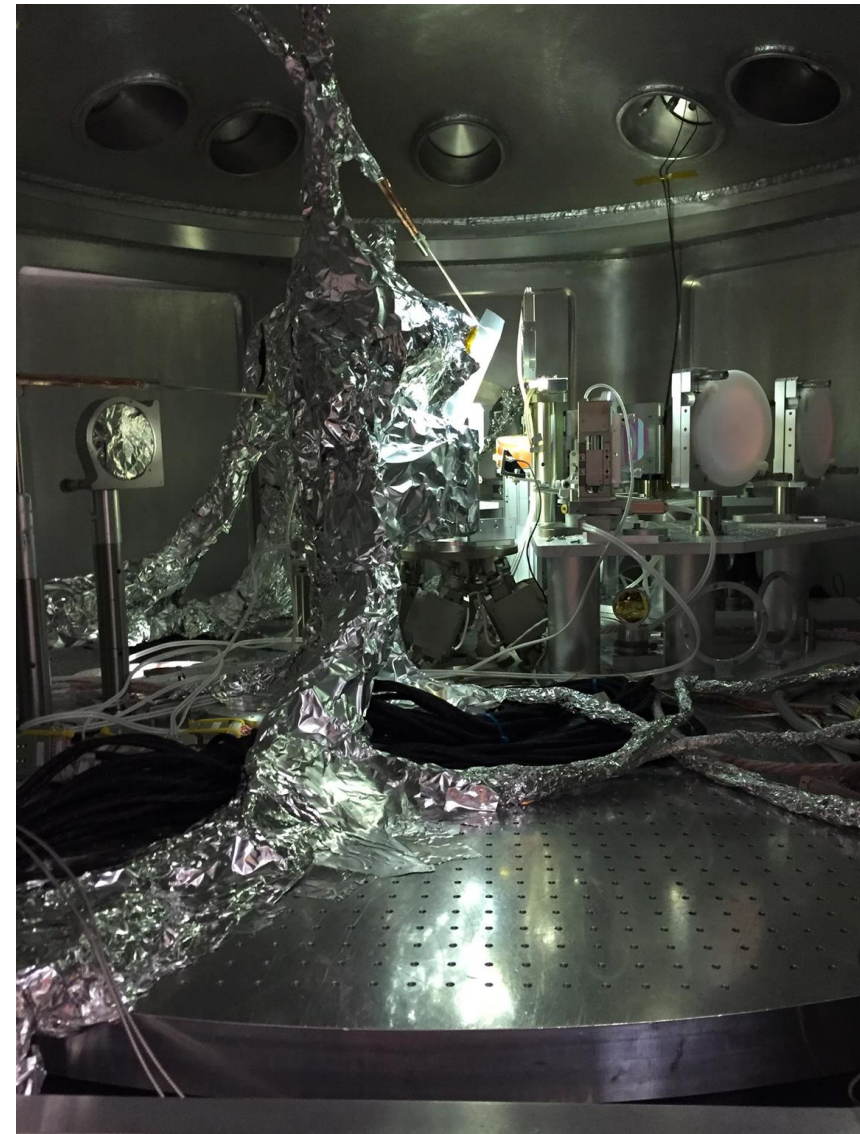
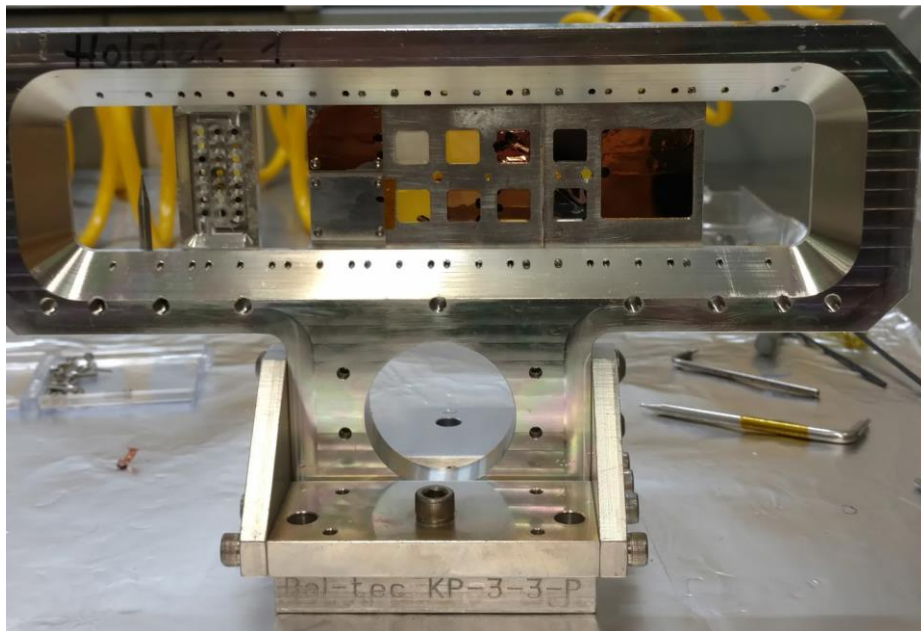
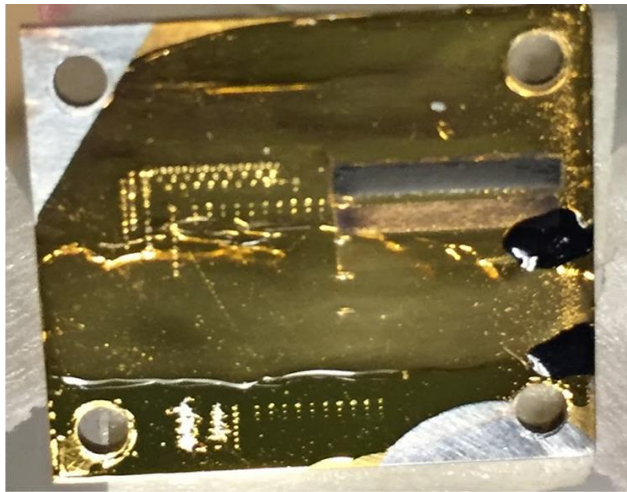


# MEC



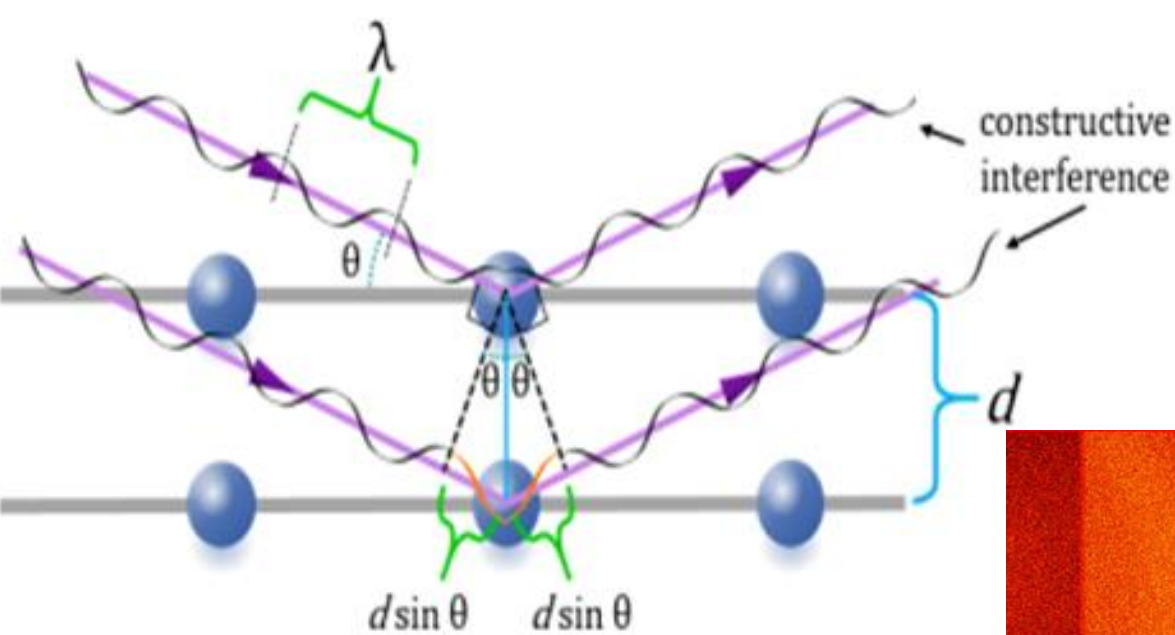
# Sample Preparation



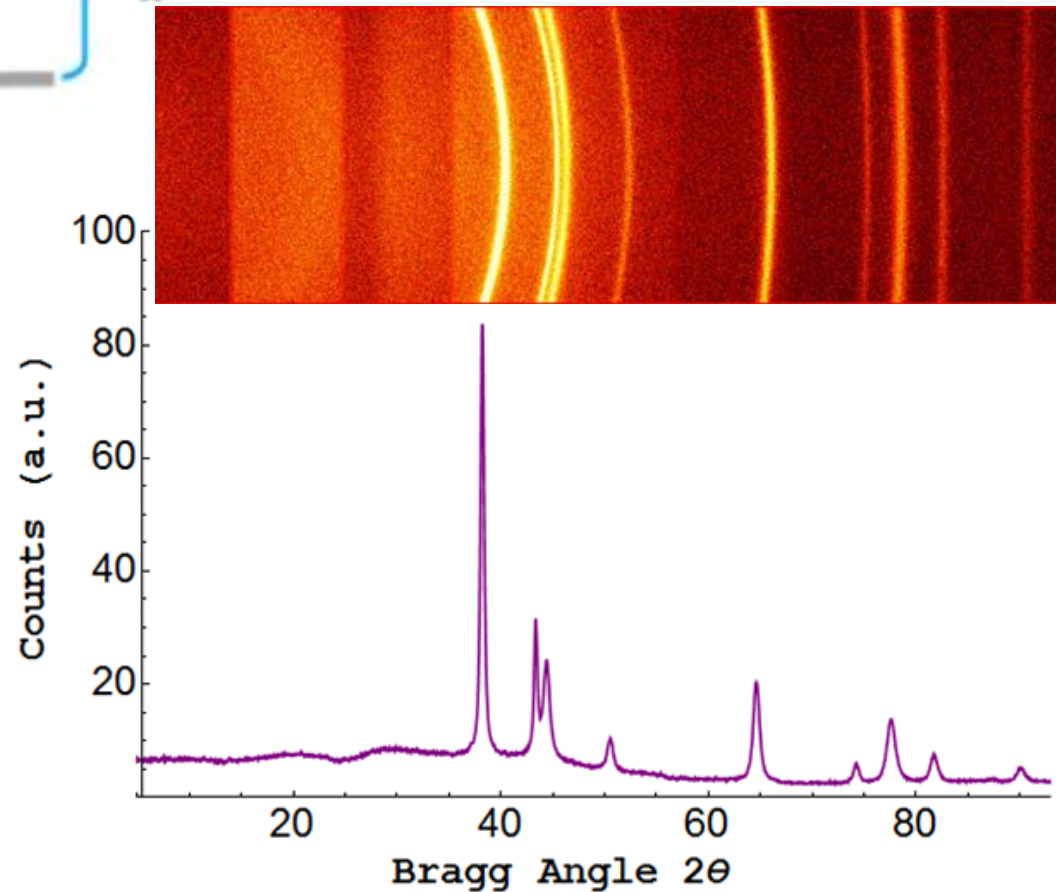


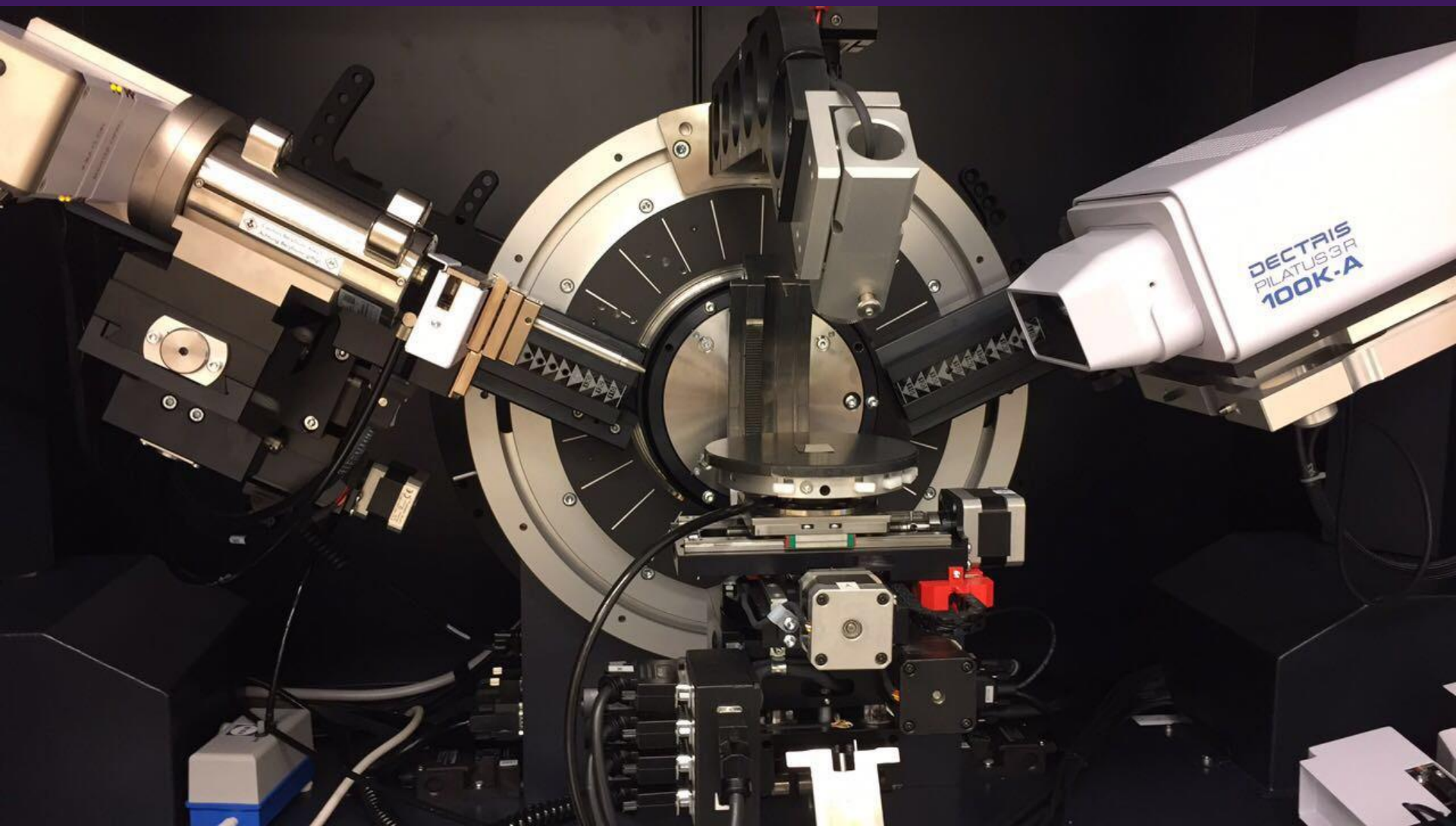


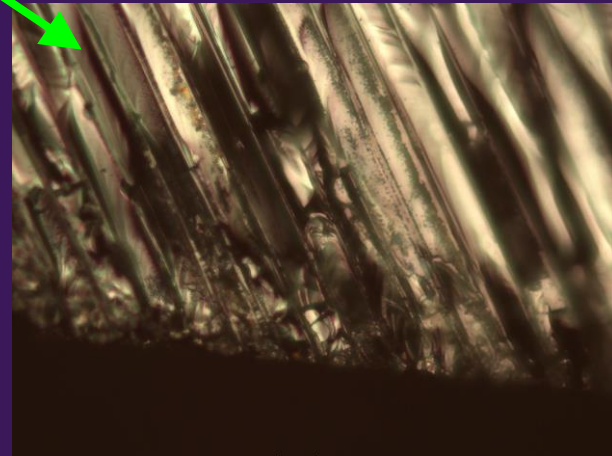
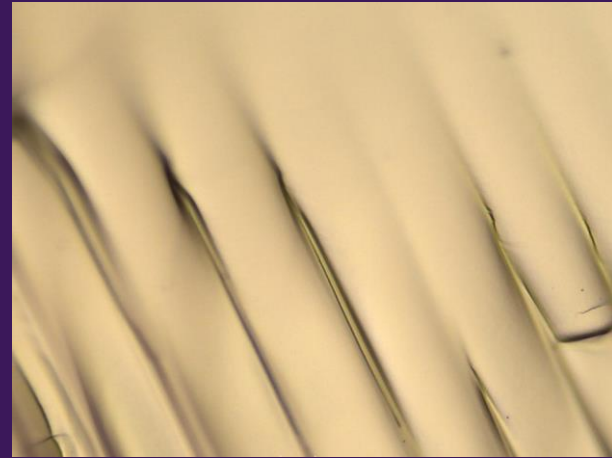
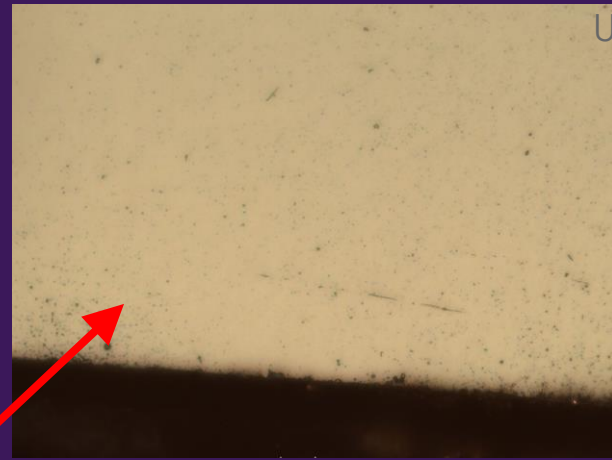
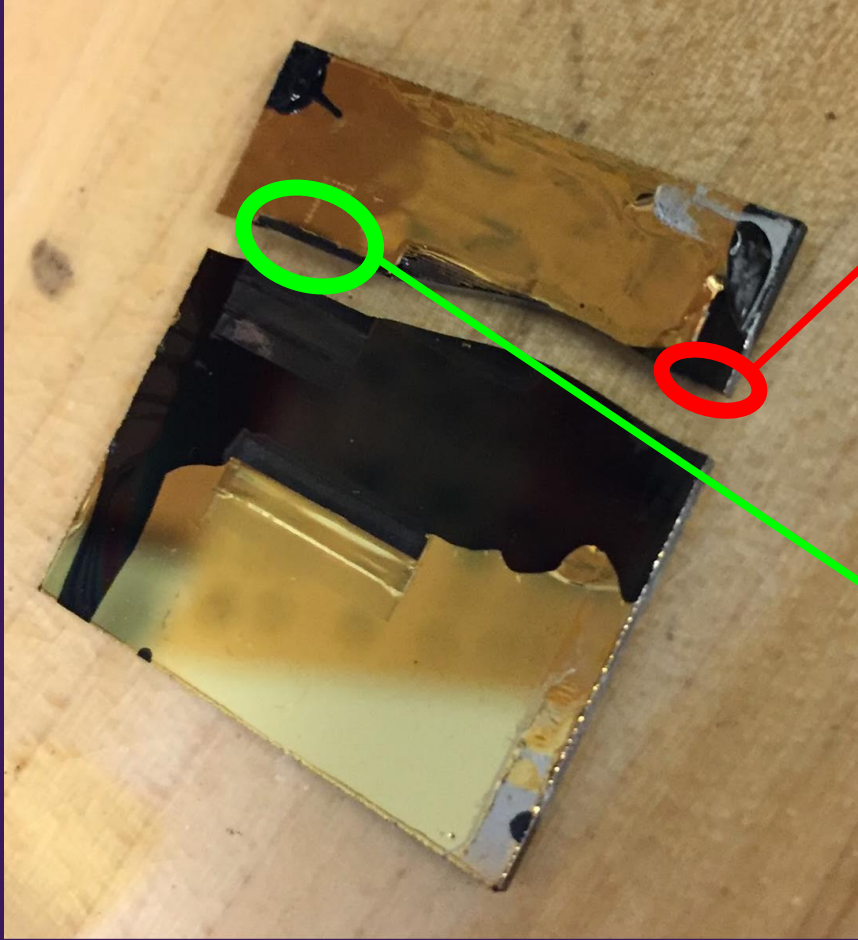
# X-ray Diffraction



Bragg's  
Law  
 $n\lambda = 2d \sin \theta$







# The Future

- The Seidler Lab
  - Diamond Searching via EBSD at PNNL
  - Analysis of other LP70 samples
- LCLS-II
  - Construction began April 2016

# Acknowledgements

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NATIONAL  
ACCELERATOR  
LABORATORY



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# Samples

Glassy Carbon	Highly Oriented Pyrolytic Graphite	Pyrolytic BN
Cu-Au-Cu	Epoxy Cast TiO <sub>2</sub>	ZrO <sub>2</sub> in PMMA
Quasicrystals	Quartzite	Al