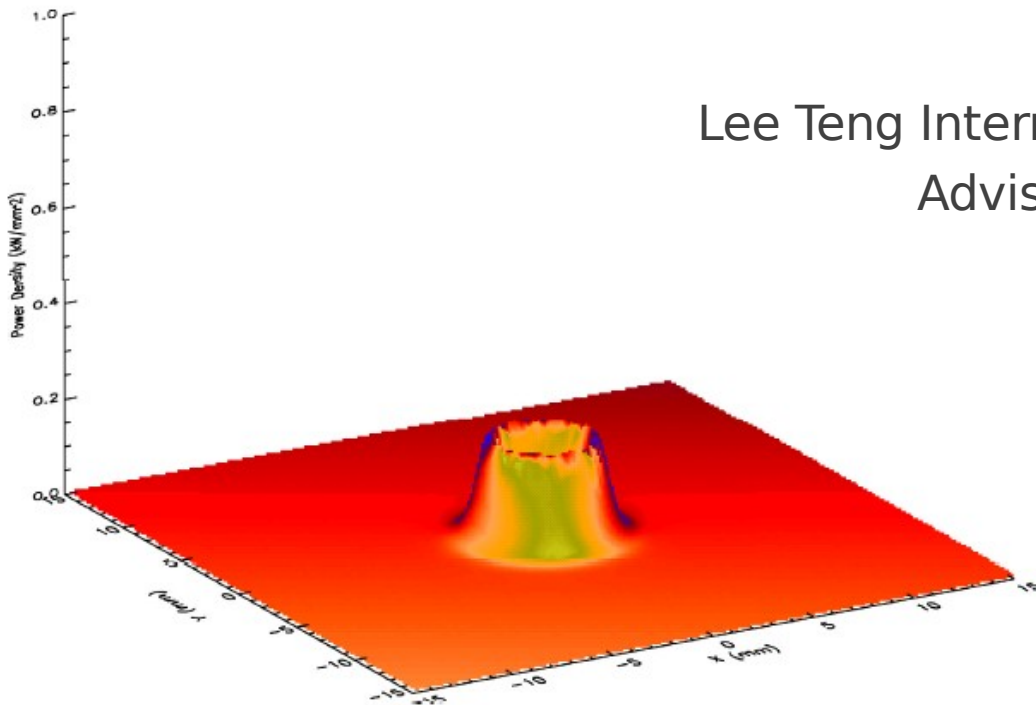# X-Ray Fluorescence BPMs – Elliptical Beam Profile
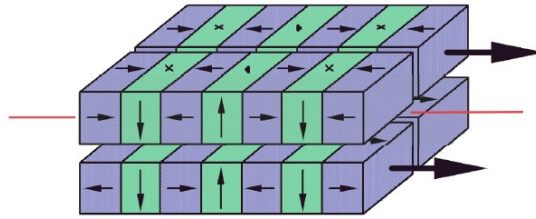
Lee Teng Internship Program 2010
Advisor: Dr. Bingxin Yang
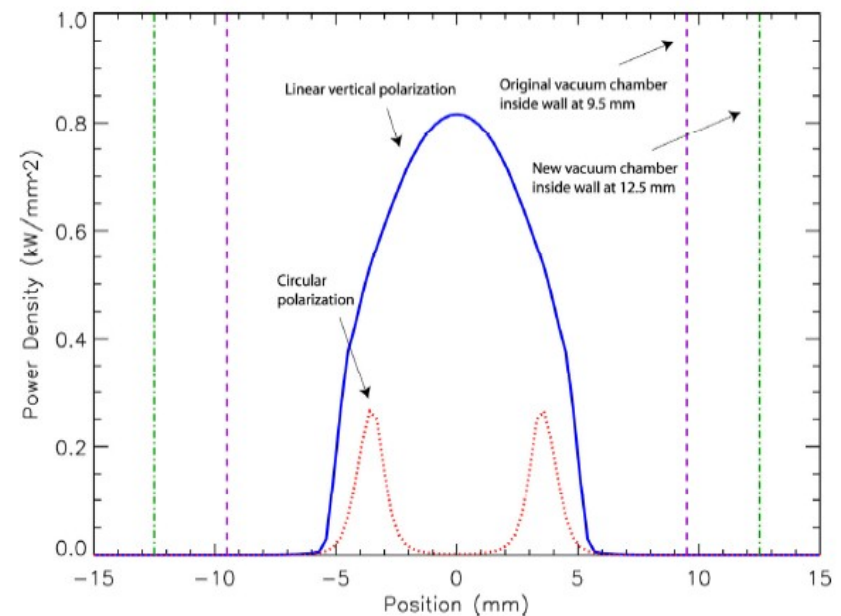Kenneth Schlax

Purpose

- User Front End
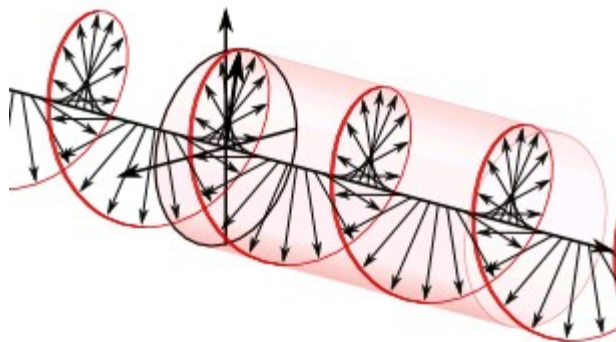- Monochromatic x-ray profile transmission
- Helical Undulators
  - Elliptical Beam Profiles
    - No previous analysis
- Beam simulation versus beam measurement

Undulator radiation

$$\lambda = \frac{\lambda_u}{2\gamma^2}\left(1 + \frac{K^2}{2} + \gamma^2\theta^2\right)$$

$$\theta_{cen} = \frac{1}{\gamma^*\sqrt{N}} \; ; \; \left(\frac{\lambda}{\Delta\lambda}\right)_{cen} = N; \; \gamma^* = \gamma/\sqrt{1 + K^2/2}$$

$$\theta_{cen} = \frac{1}{\gamma^*\sqrt{N}}$$

2
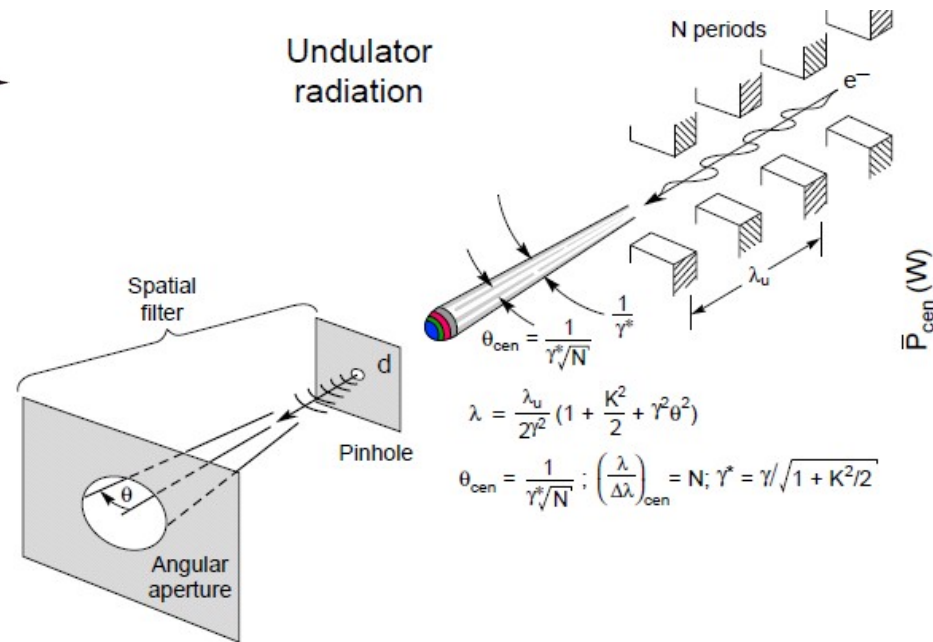
Work to date

- Simulate Linear Undulator Beam
  - Total Power
  - Monochromatic Power
- Vary Undulator Parameters
  - Gap, aperture sizes
- Programs: SDDS, XOP

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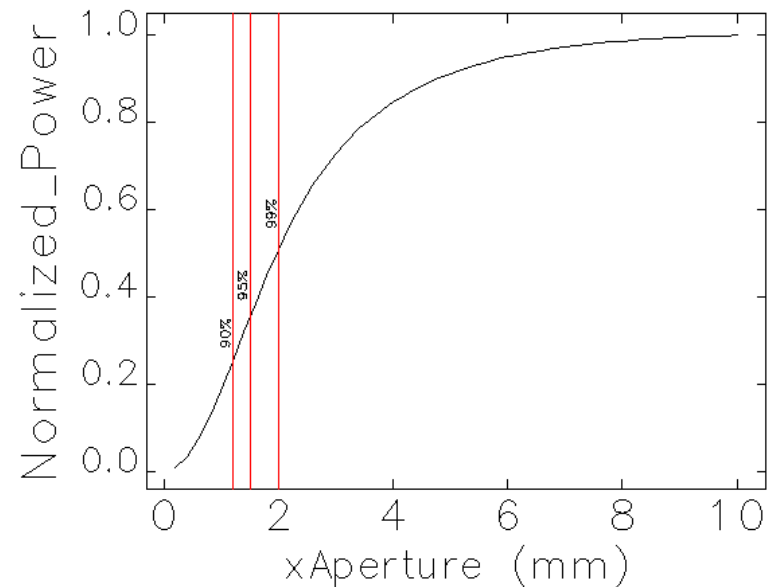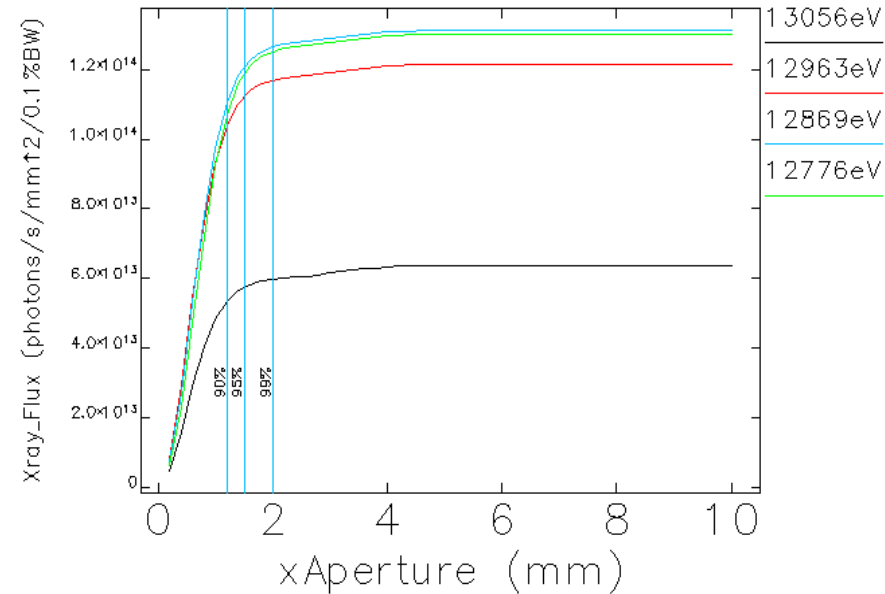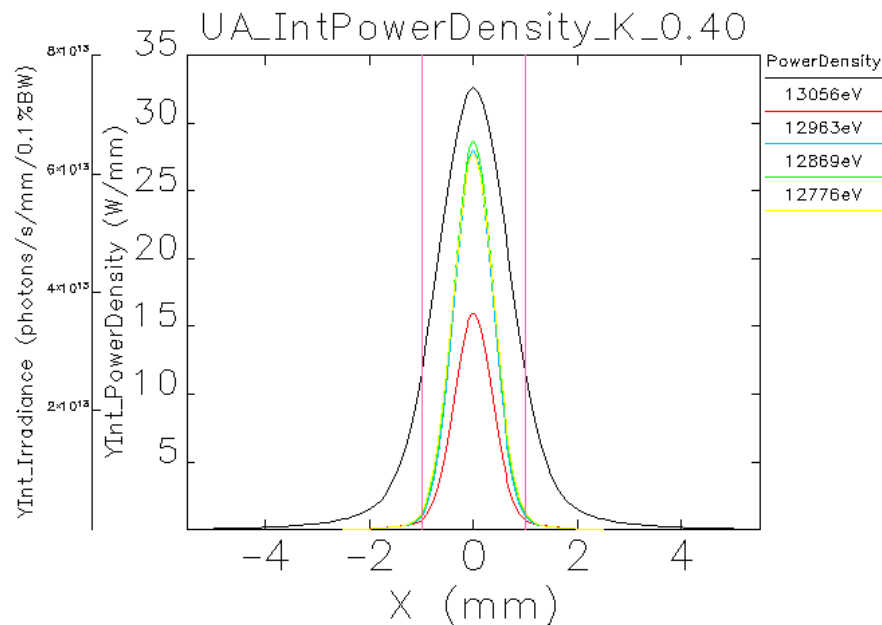
Work to be completed

- Simulate Elliptical Undulator Beam: *EM Diagram*-->
  - Determine appropriate aperture size
    - Permit sufficient monochromatic xrays for research
    - Intercept sufficient power to perform measurements
- Investigate x-ray distribution and properties in K-space
- Prepare user-friendly report with trends, plots, tables, etc.
- Work towards vertical grazing incidence copper XBPM
  - Planar fluorescence, pinhole camera
- Update XBPM with undulator changes
- Model XBPM structure, response

- Typical work:
  - Validate SDDS results in XOP
  - Determine trends: *Power profiles vs. K -->*
  - Investigate higher harmonics

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Top: Roger Dejus, Bottom: own work