Ohio State:
Solid Target Experiments on the Texas PW

Laser-generated electron beam divergence & Isochoric heating

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Outline

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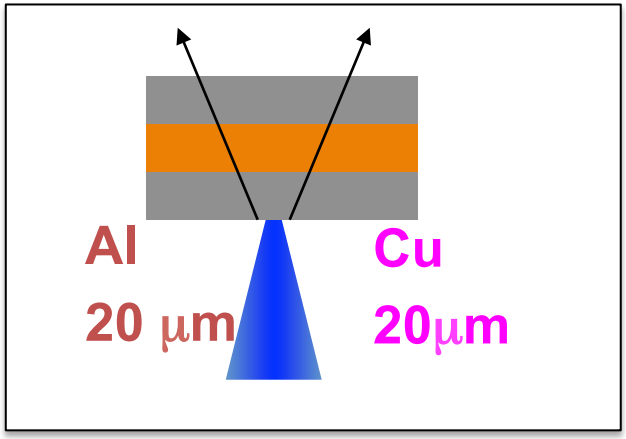
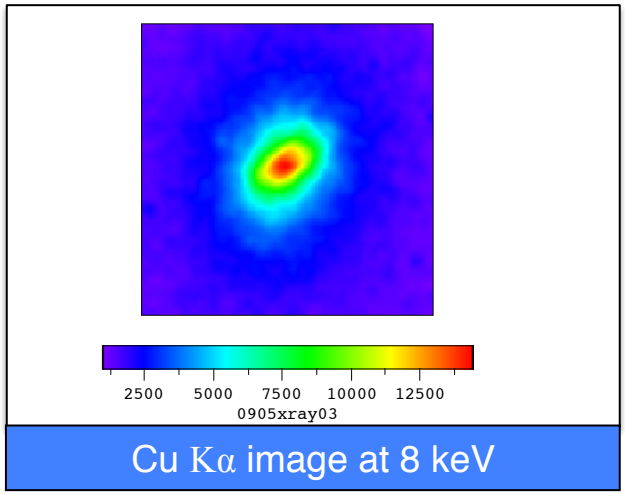
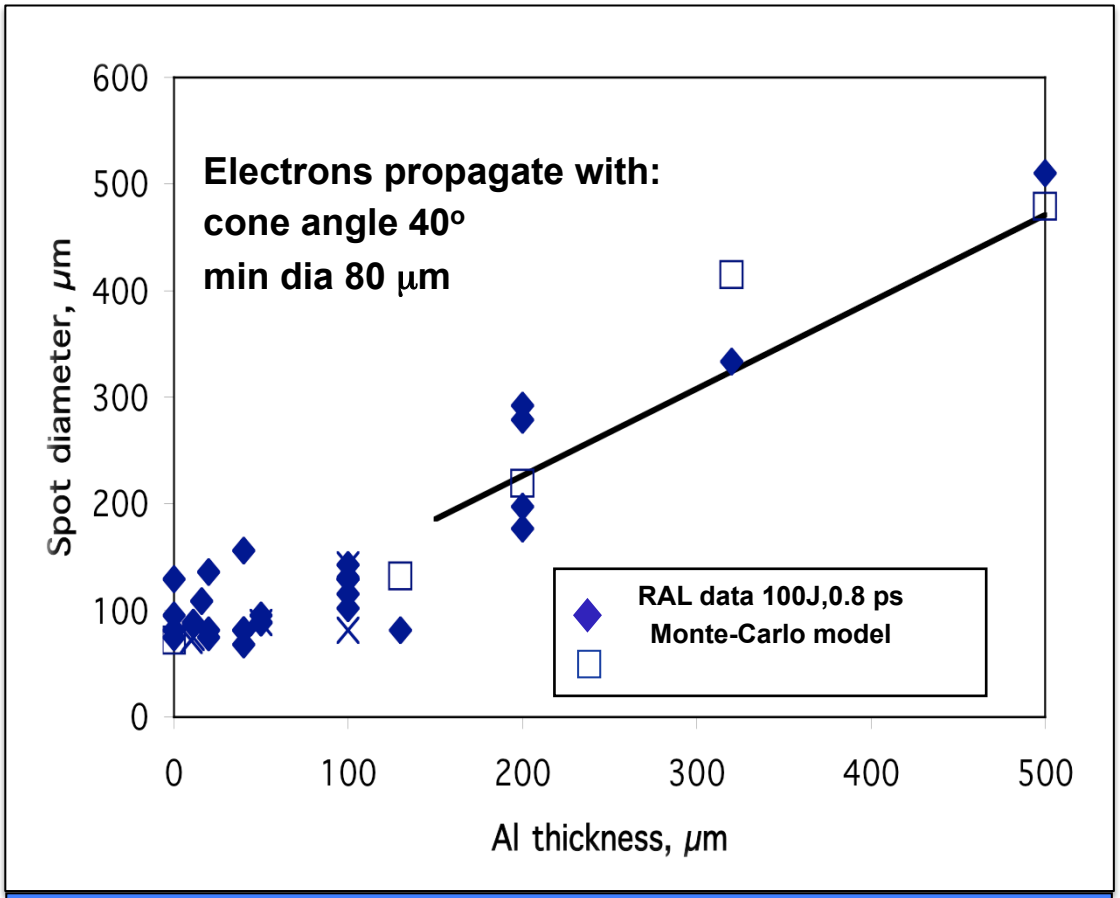
- **Laser-generated electron beam divergence**
  - First experiment on TPW using solid targets
  - Use similar targets to ones used on Titan
- **Isochoric heating using reduced mass targets (RMT)**
  - Previous work on Vulcan: reduce the thickness of the target
  - On TPW: reduce the lateral dimensions and keep thickness constant

Kα imaging is the most widely used diagnostic for laser generated electron beam divergence





Cu Kα image at 8 keV

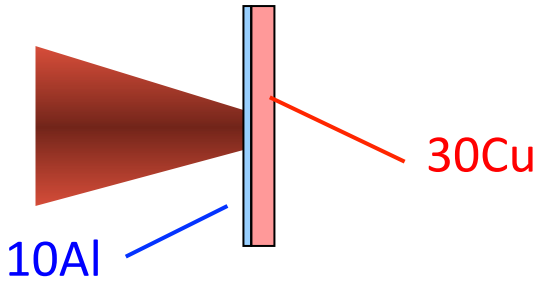


R Stephens et al. *Phys Rev E* **69**, 066414 (2004)

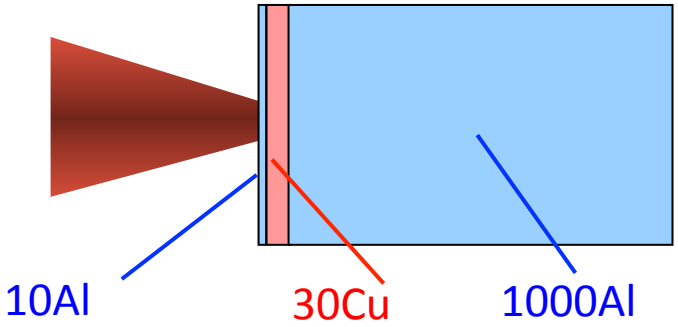
Laser generated electron beam has ~ 40° spreading angle

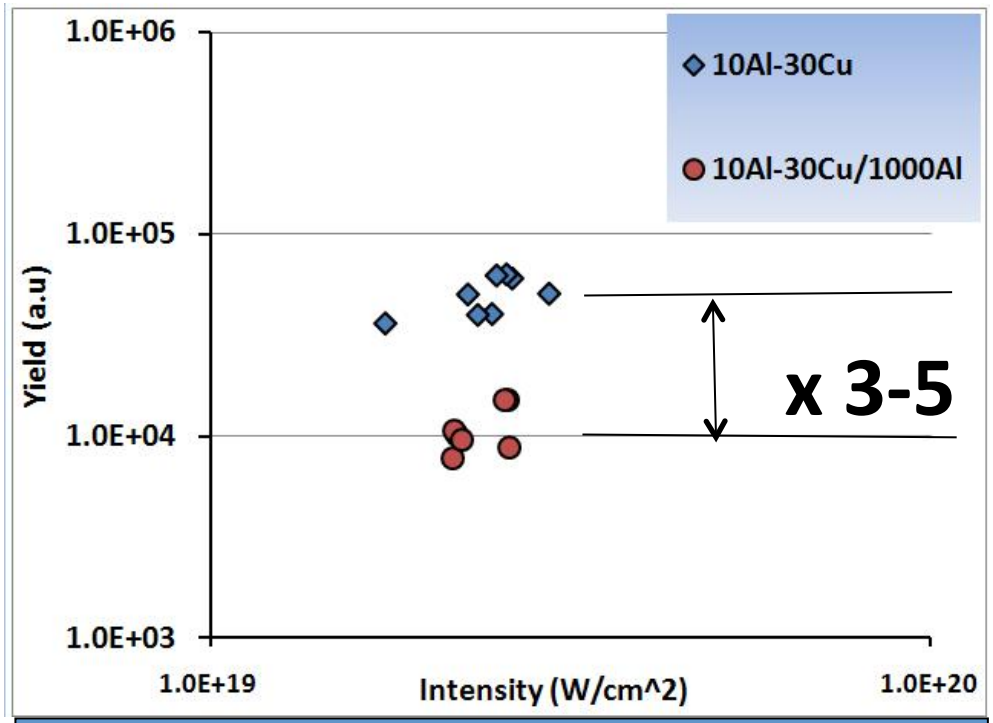
Electron refluxing in thin targets is important and can change the Kα spot size

- **Refluxing target**



- **Non-refluxing target**

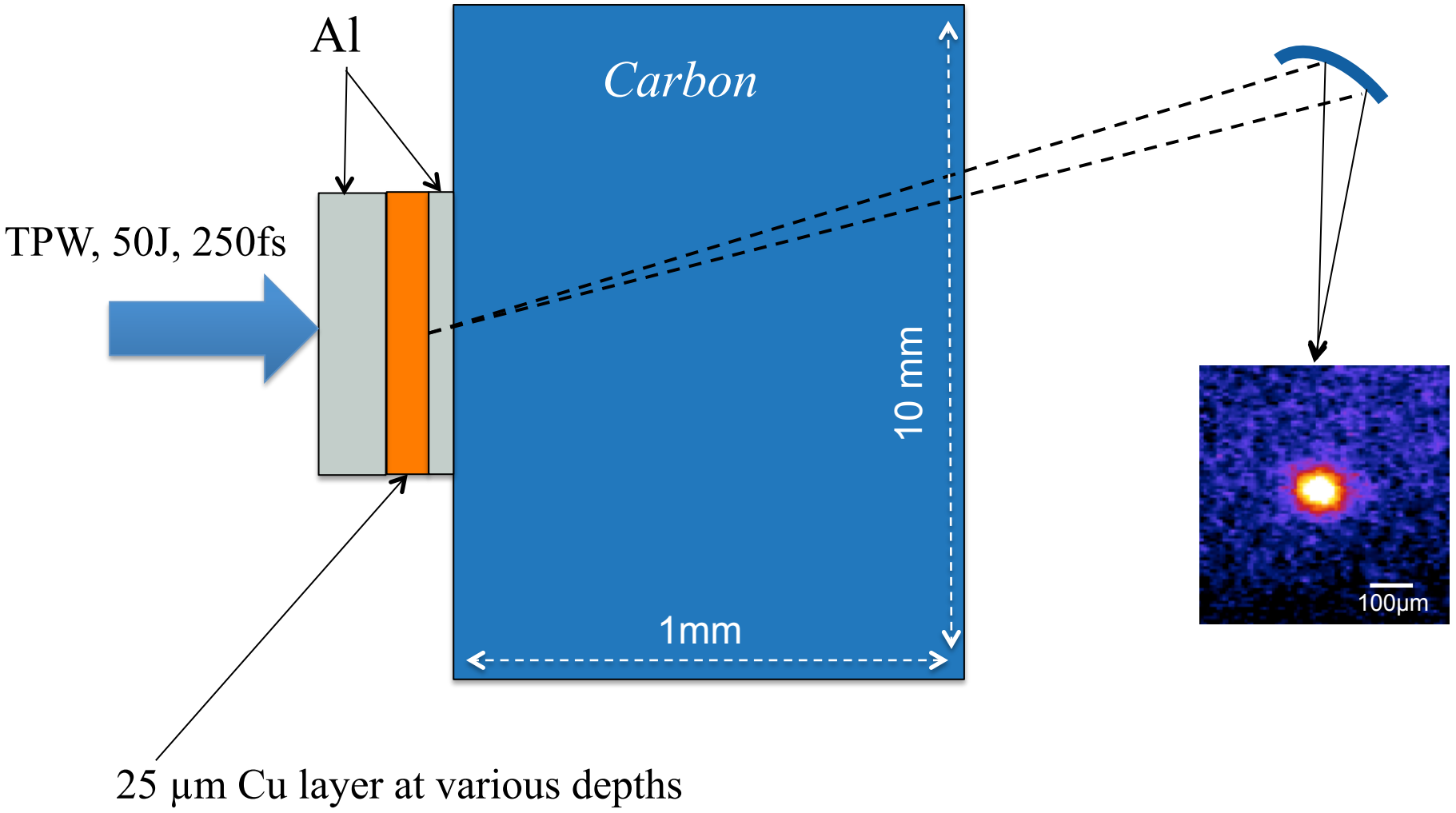




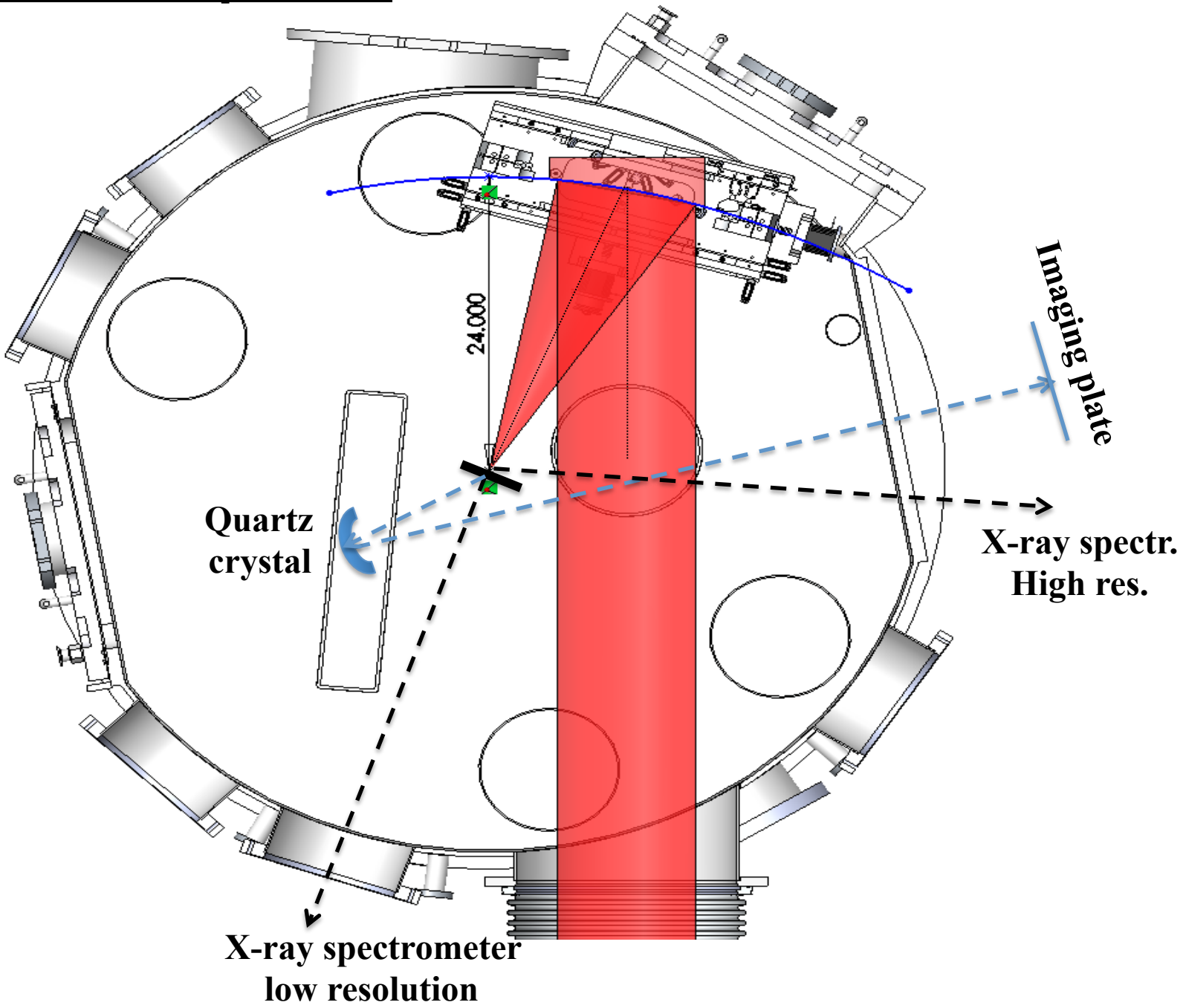
fluorescence ratio is a factor of 3 to 5 higher in refluxing targets than non-refluxing ones

Non-refluxing targets must be used for divergence measurements

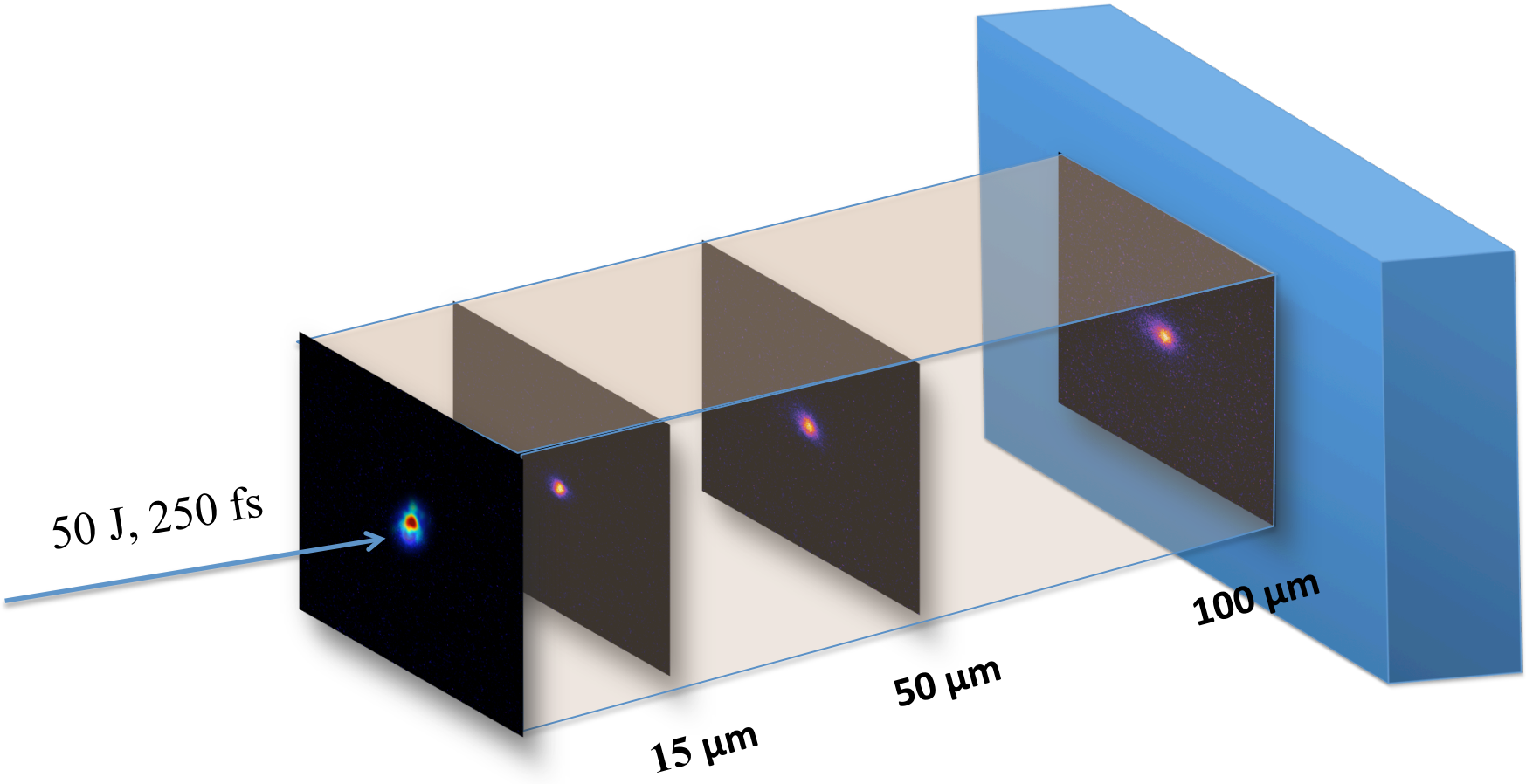
Non-refluxing targets with carbon get lost layer (GLL) were used to measure electron divergence using TPW



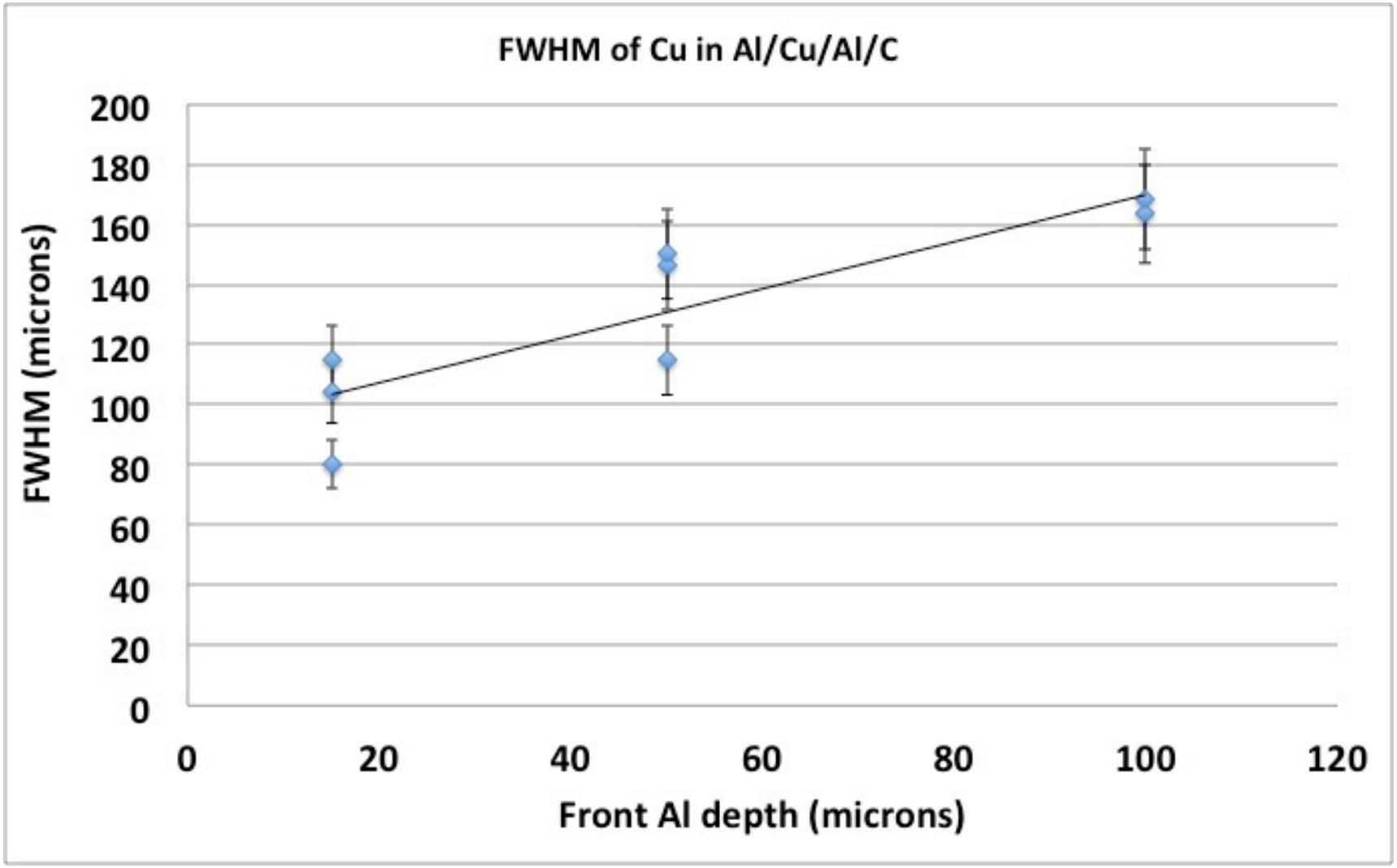
Experimental setup at TPW



2D spatially spatially resolved monochromatic images were acquired at 15, 50, and 100 µm depths



Divergence with 50J 250fs pulses



Laser generated electron beam has ~ 40° spreading angle

TPW laser beam focal spot, pulse length, and energy

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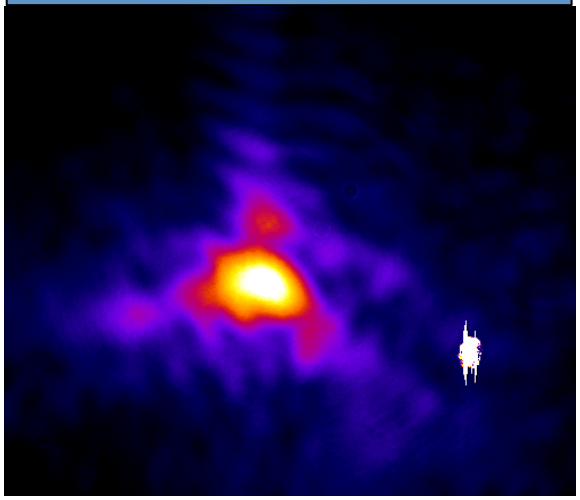
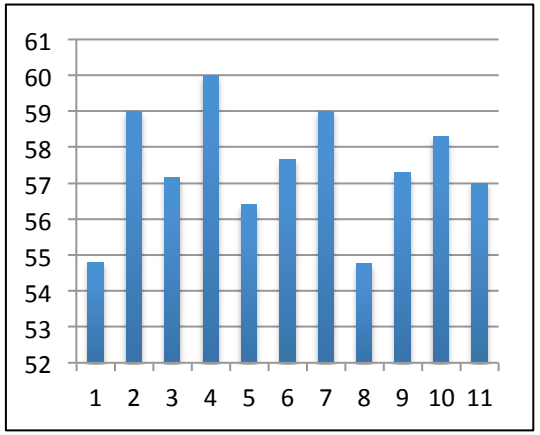
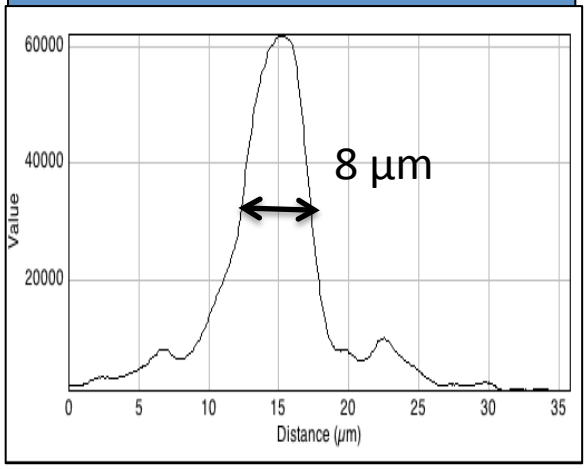
Focal spot



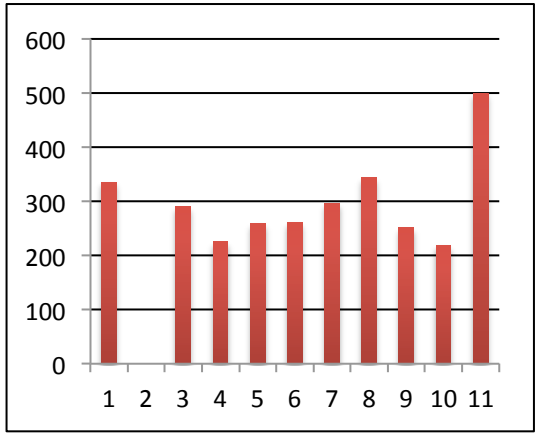
Aver. E = 57 J



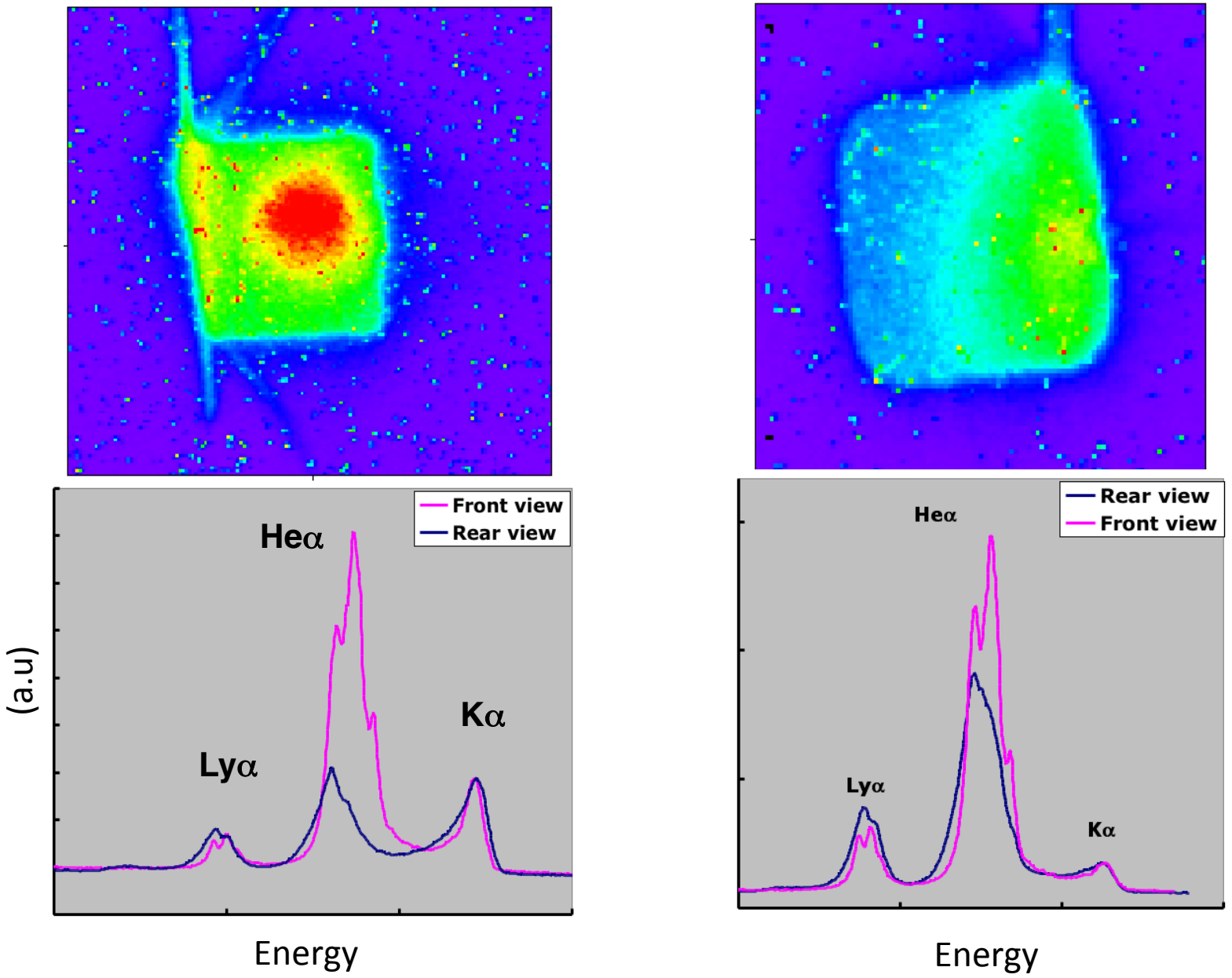
lineout



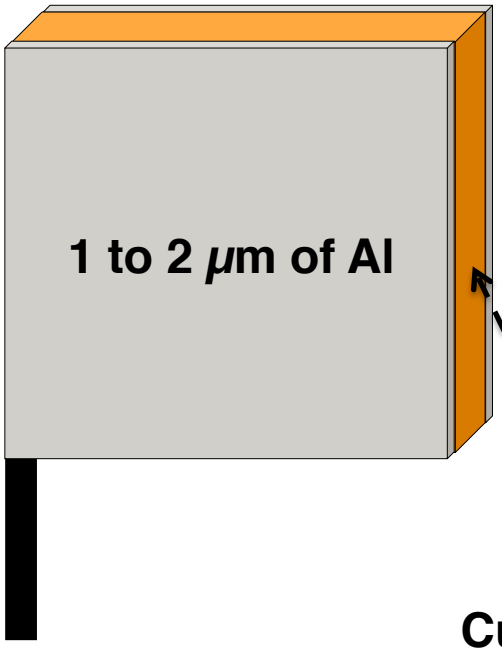
Aver. τ = 300 fs



Previous experiments with RMT showed uniform heating when the target thickness is reduced

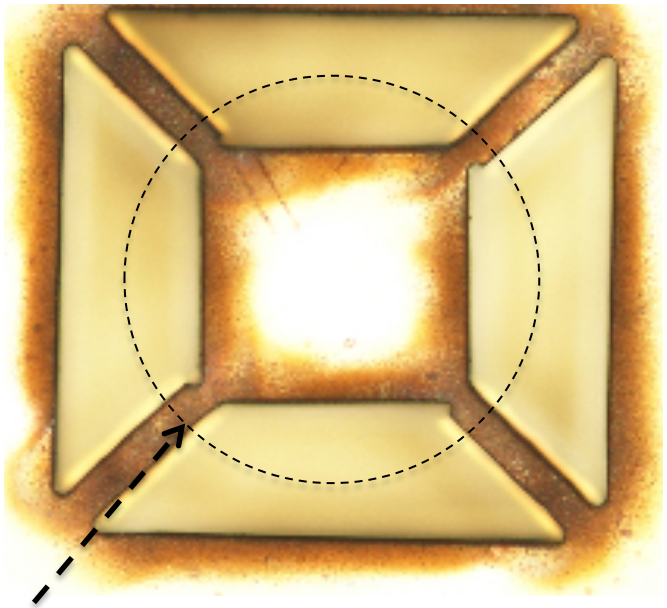


RMT used on TPW



Cu 5 μm thick

Actual target

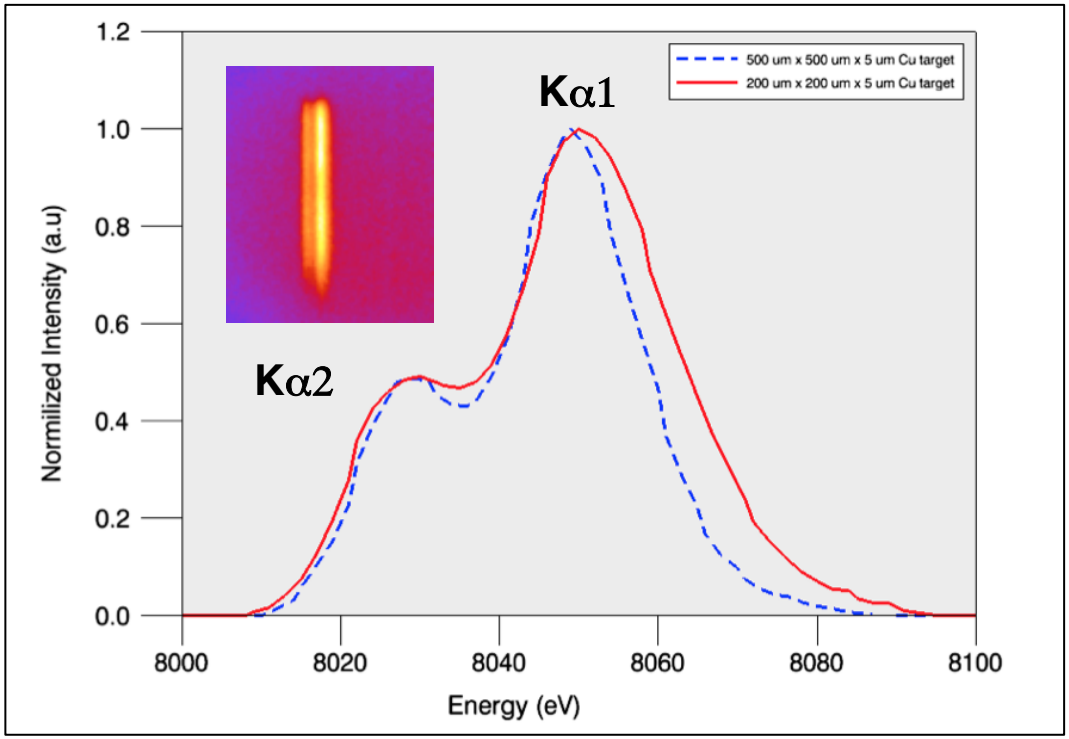


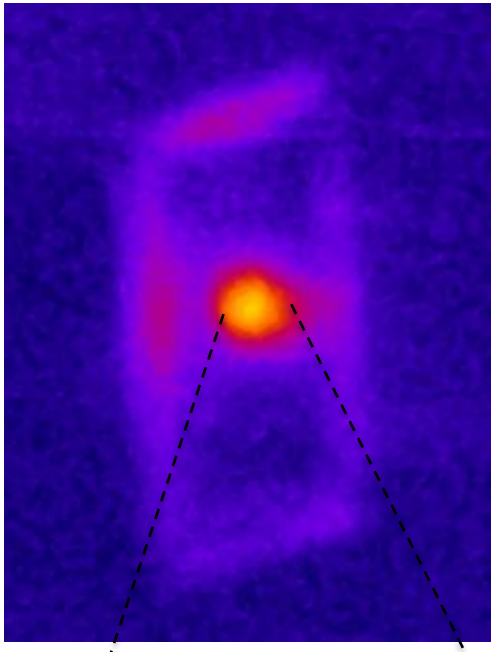
200μm x 200μm

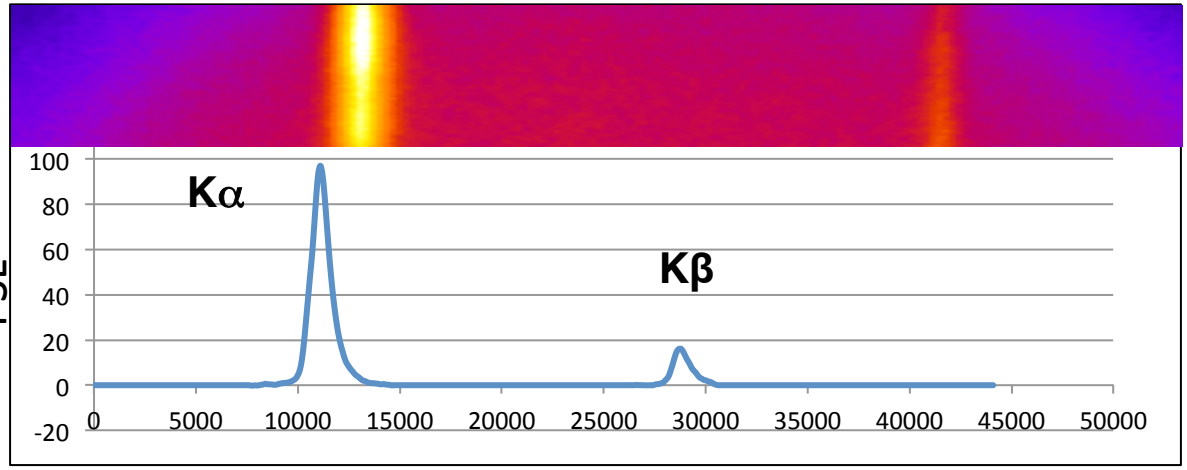
500μm x 500μm

800μm x 800μm

Isochoric heating with 50J 250fs using Reduced Mass Targets







$$\phi = 100\ \mu m$$

$$T \sim 50 - 60\ eV$$

Conclusion

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- **Laser-generated electron beam divergence was measured on TPW using non- refluxing targets**

- **Reduced mass targets were isochorically heated with 50J 250fs pulses yielding a bulk temperature of 50-60 eV**

Co-authors and acknowledgement

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