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In collaboration with

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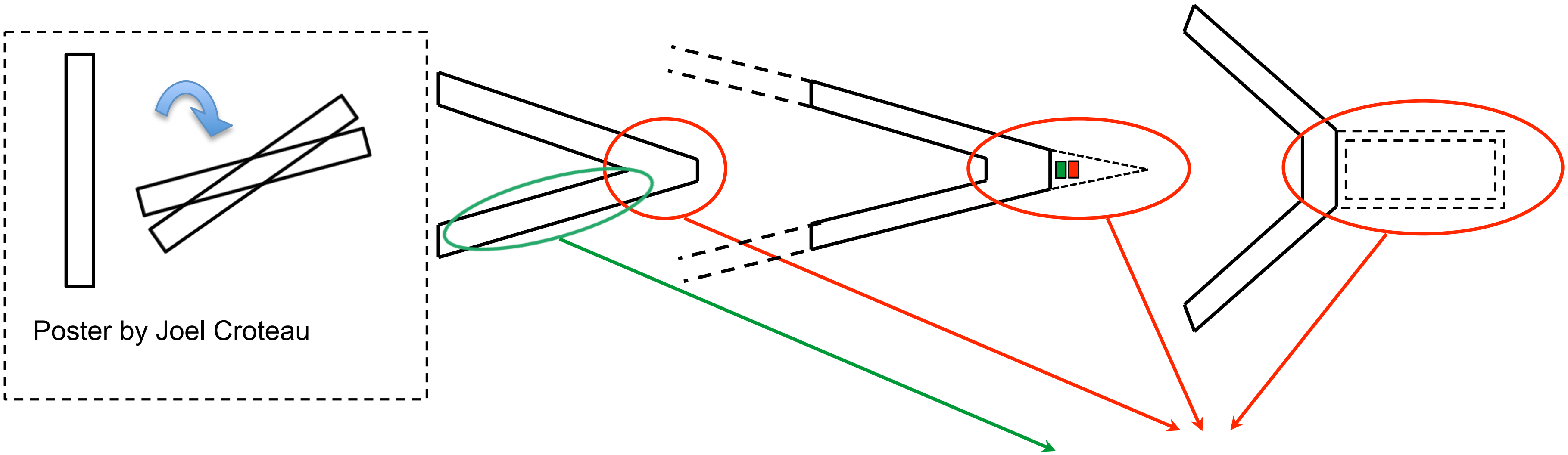
Explore HED possibilities…



Well diagnosed experiments:

Hard x-ray bremstrhalung

Copper Kalpha imaging

Backscattering

Dual wavelength CTR ω/2ω to monitor JxB and resonance absorption

Bunching diagnostic in code, ω 2ω

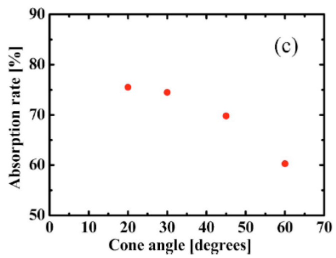
→

Higher energy densities and particle fluxes relevant to:

- **Fast Ignition - Fusion**
- **Lab Astrophysics**
- **Equation of States**
- **Medical Applications**
- **Enhanced Backlighters**
- **Proton beams**

The cone target: a HED target with potential

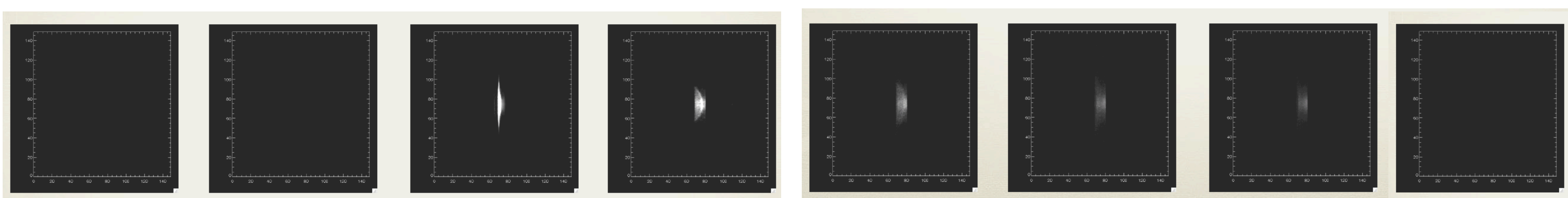
Cone show much higher absorption, larger electron energy density areas, more uniform and for longer periods of time



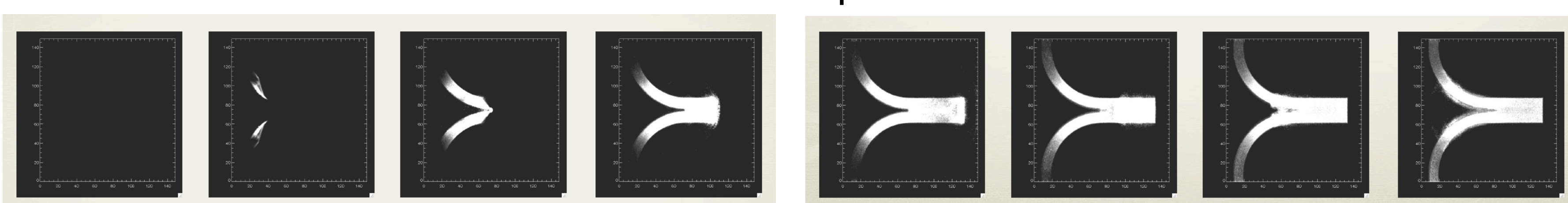
Nakamura et al., PoP, 14 103105 (2007)

Consistent with absorption in Lasinski et al, PoP 16, 012705, (2009), Van Woerkom et al., PoP 15, 056304 (2008),

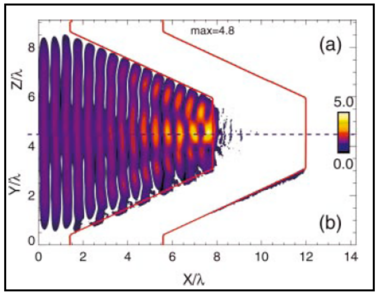
Flat - absorption = 13%



Cone -absorption = 70%

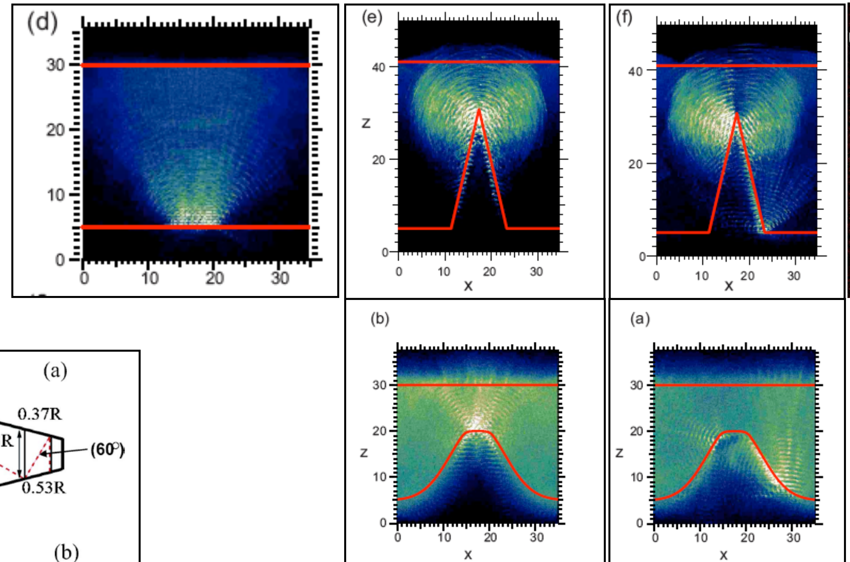


Alignment on axis is important, use the cone to micro-focus

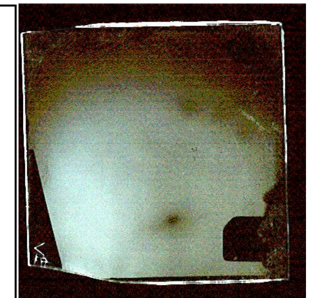


Sentoku et al., PoP, 11, 6, pp. 3083-3087 (2008)

Flat | On-axis | Off-axis



Lasinski et al., PoP, 16, 012705 (2009)



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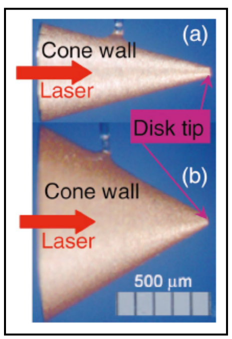
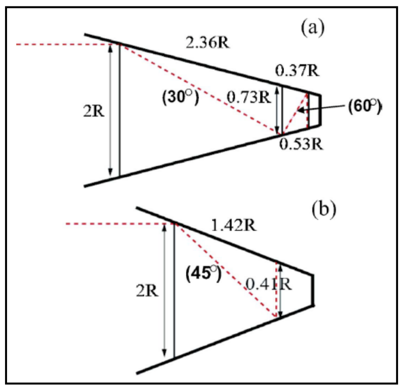
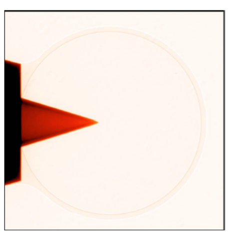


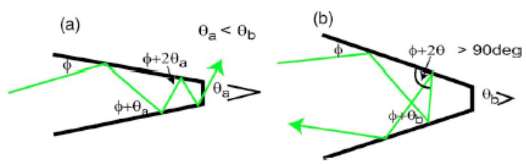
Chen et al., PRE, 71, 036403 (2005)



Nakamura et al., PoP, 14 103105 (2007)



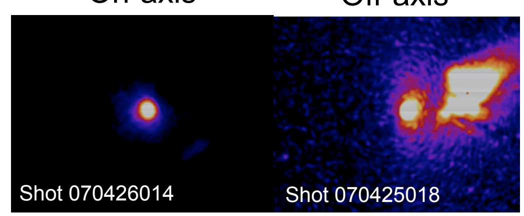
Stoeckl et al., PoP, 14, 112702 (2007)



Nakatsutsumi et al., PoP, 14, 050701 (2007)

Coherent Transition of Radiation

On-axis | Off-axis



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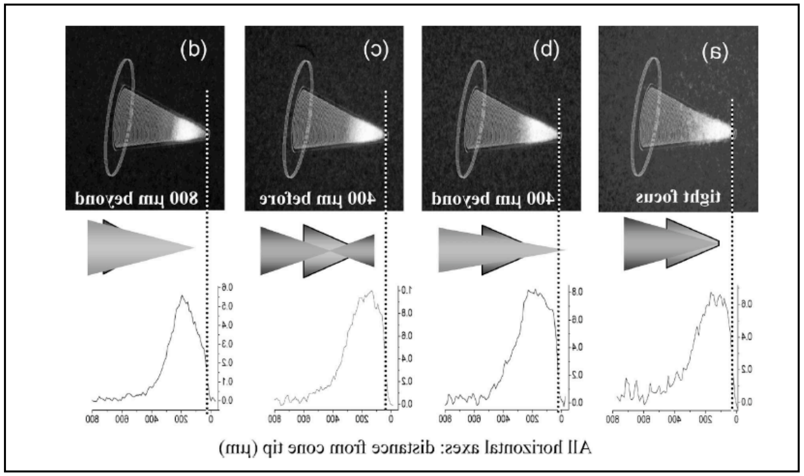
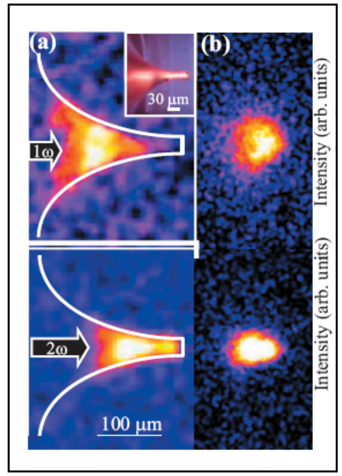
Does the laser see a cone shaped target or a confined pre-plasma?

Cu Kα fluorescence



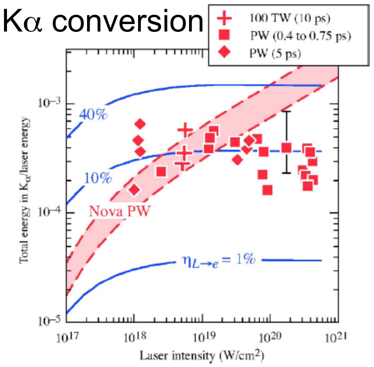
Van Woerkom et al., PoP, 15, 056304 (2008)

Cu Kα fluorescence

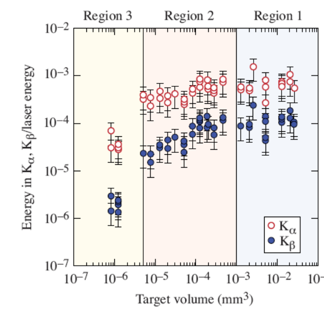


Rassuchine et al., PRE, 79, 036408 (2009)

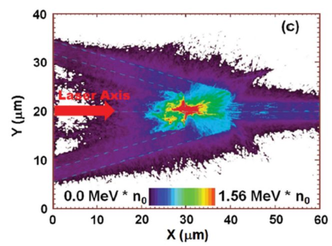
Kα conversion



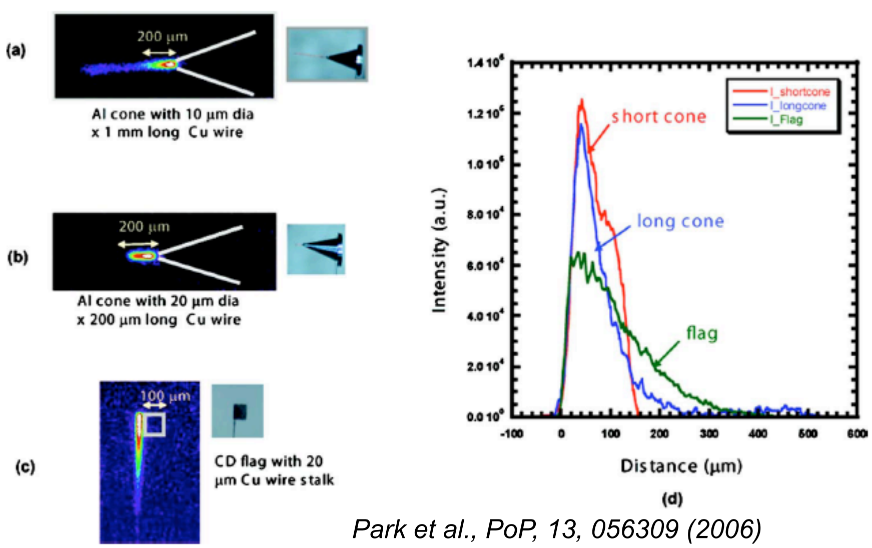
Myatt et al., PoP, 14, 056301 (2007)



Nilson et al., PoP, 15, 056308 (2008)



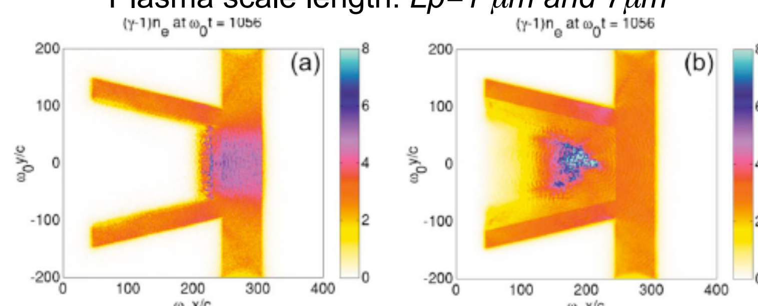
H. Nakamura et al., PRL, 102, 045009 (2009)



Park et al., PoP, 13, 056309 (2006)

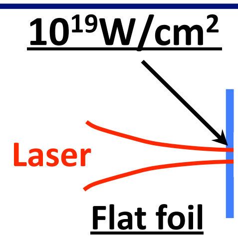
Electron kinetic energy density

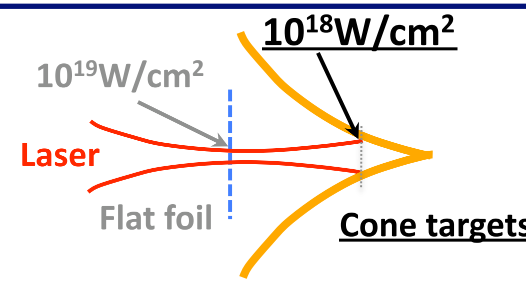
Plasma scale length: *Lp=1 µm and 7µm*

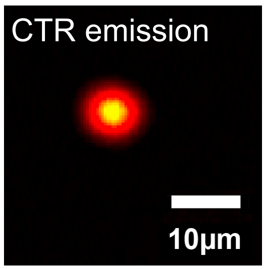


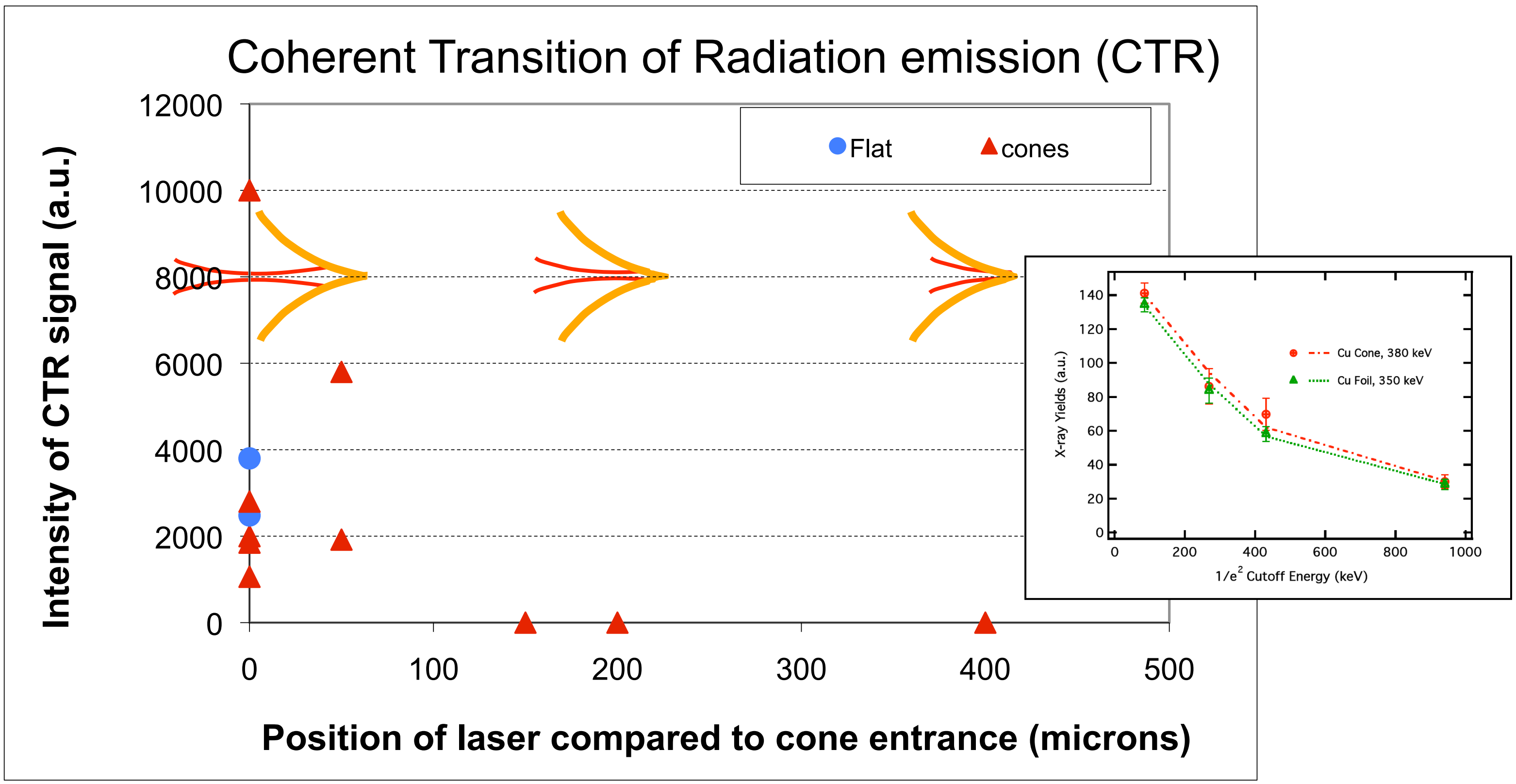
S. D. Baton et al., PoP, 15, 042706 (2008)

When the confined pre-plasma is mitigated we can see the signature of the electron beam





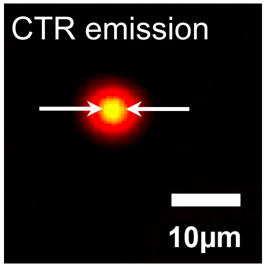


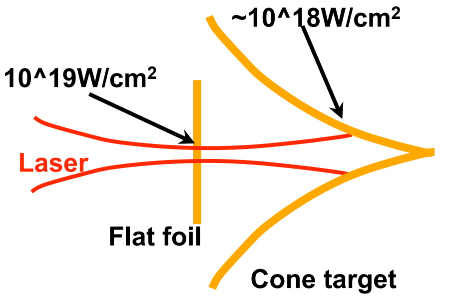


N. Renard-Le Galloudec et al., RSI, 79, 083506 (2008)

The cone target, under specific conditions actually micro-focuses the laser light

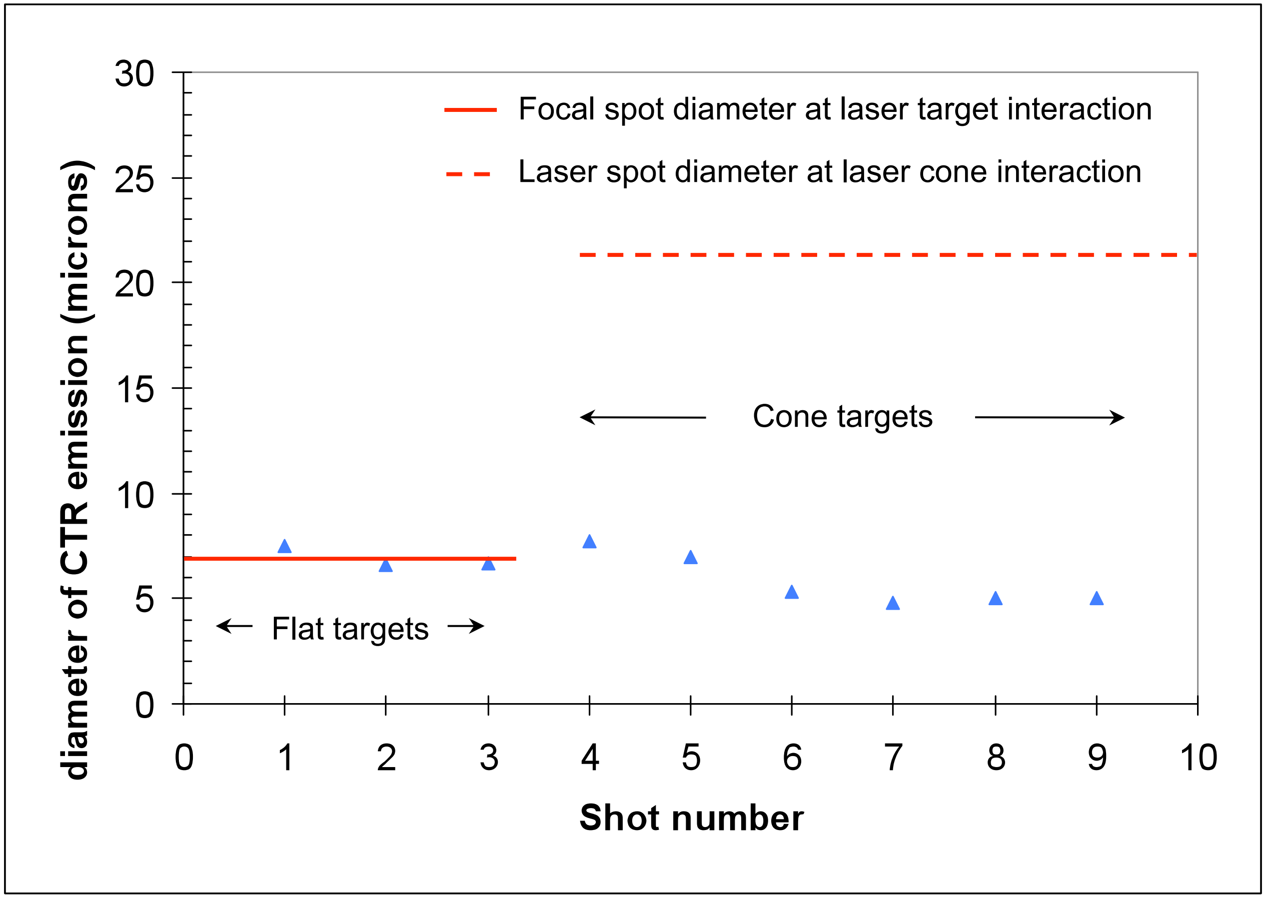
The laser diverges when entering the cone, irradiating a spot 3 times bigger than on flat targets. We however see sizes of CTR emissions from the tip of cones equal to the inside tip sharpness





No laser imprint

Coherent Transition of Radiation emission (CTR)



N. Renard-Le Galloudec et al., RSI, 79, 083506 (2008)

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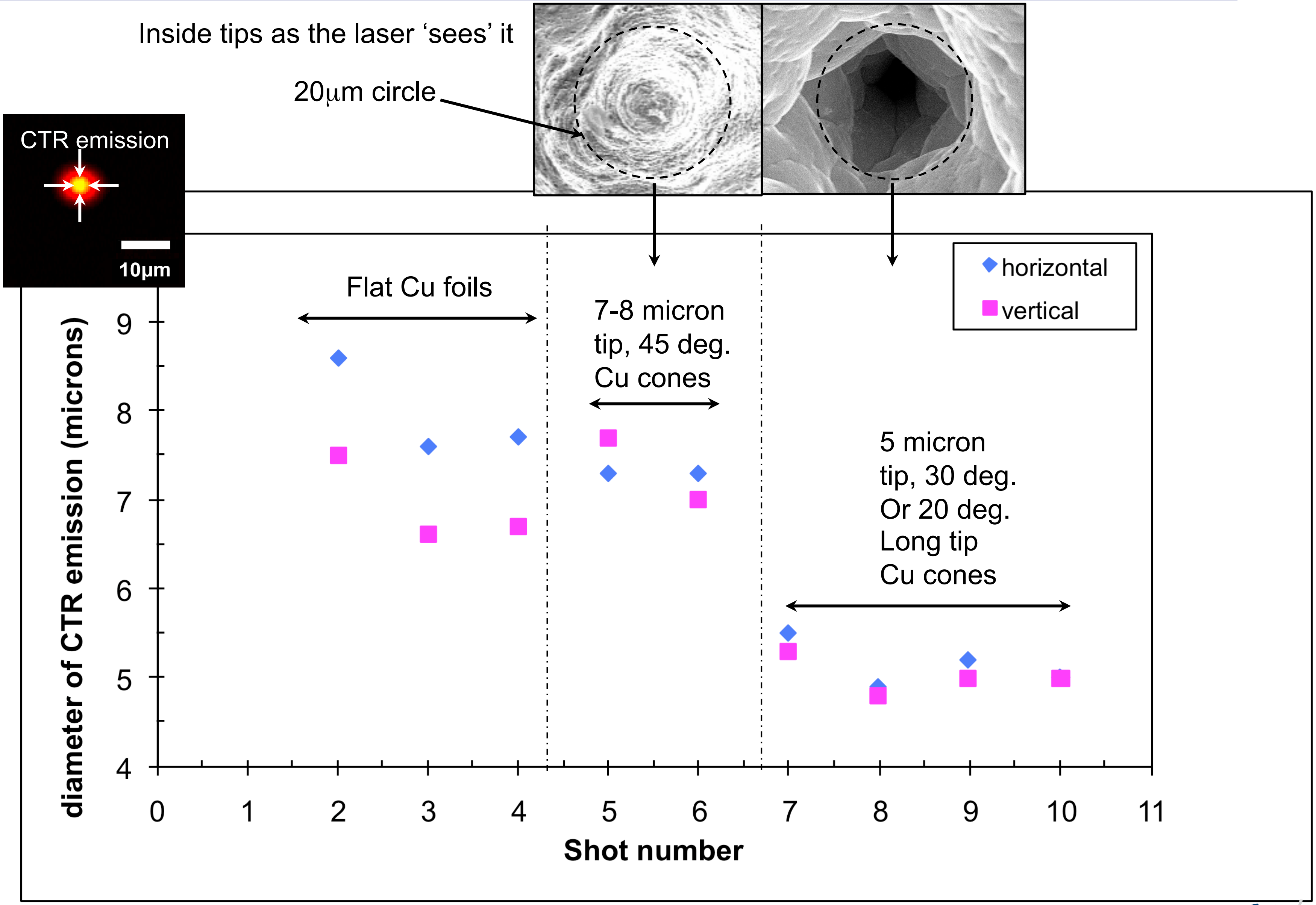
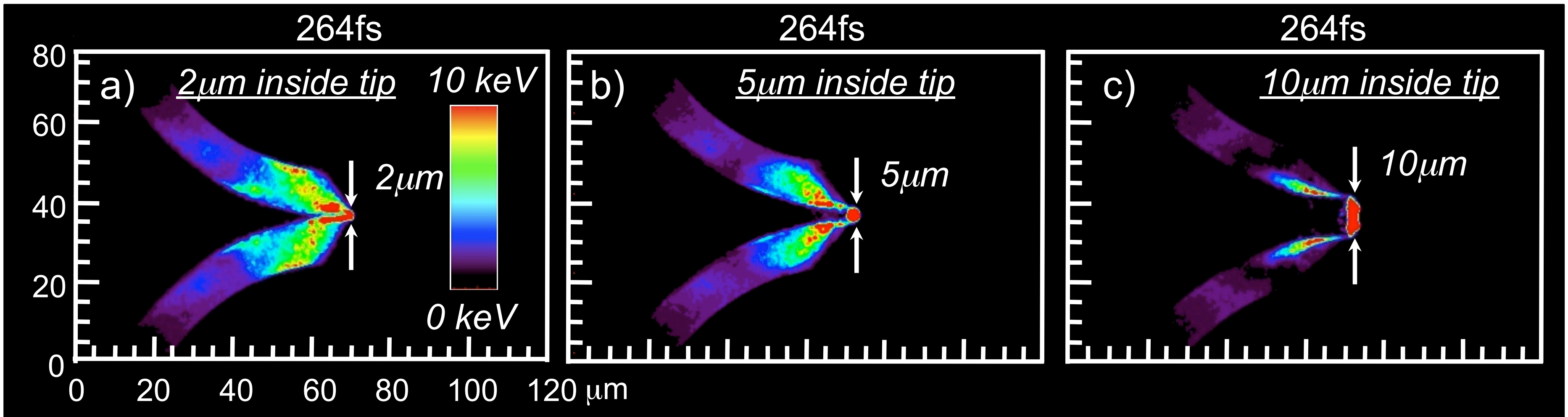
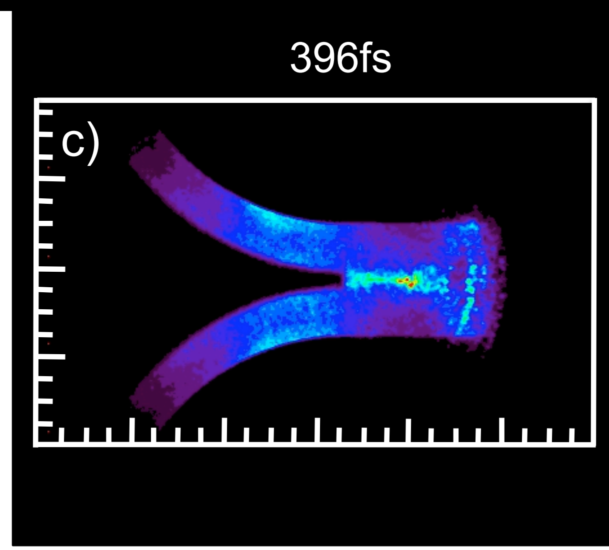
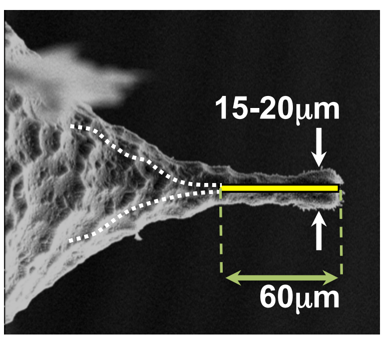
Sharper, longer cone targets produce smaller and more reproducible source size



Simulations confirm the inside tip size defines the diameter of the electron beam and transport in the canal embedded in the tip







N. Renard-Le Galloudec et al., Phys. Rev. Lett. 102, 205003 (2009)

<u>Relevant reference:</u>
A. P.L. Robinson and M. Sherlock, PoP 14, 083105 (2007) Magnetic collimation of fast electrons produced by ultra-intense laser irradiation by structuring the target composition.

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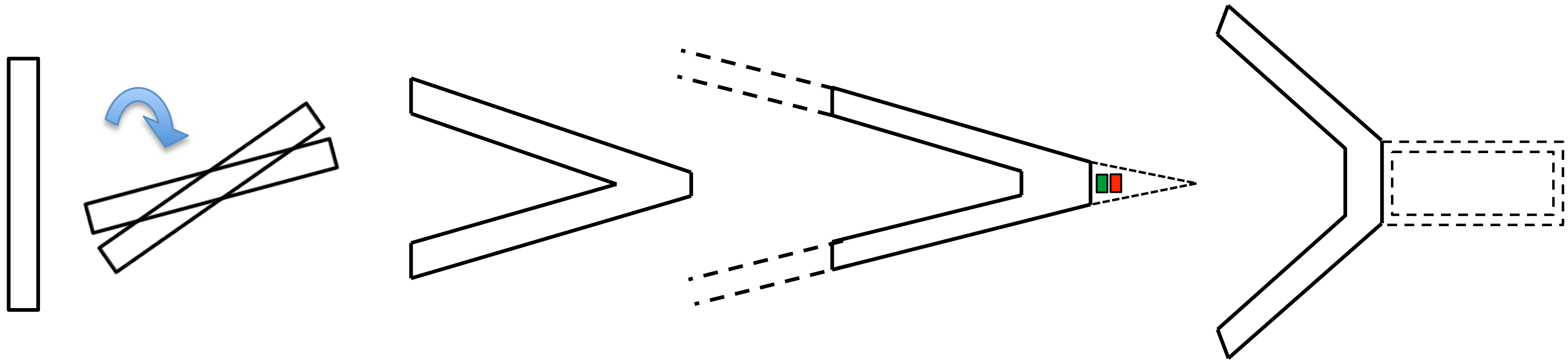
Explore HED possibilities…



Increases absorption, creates areas of HED at the tip that are free of laser imprint (multiple bounces), shaping the target can modify the e-beam characteristics, focusing at the base opens possibilities for cones with an angle smaller than the optic f#

<u>for:</u>

Fast Ignition? Advanced Backlighters? Shaped, monoenergetic proton beams, Cones for shocks?

What aspects are of interests?

Who?

How?