

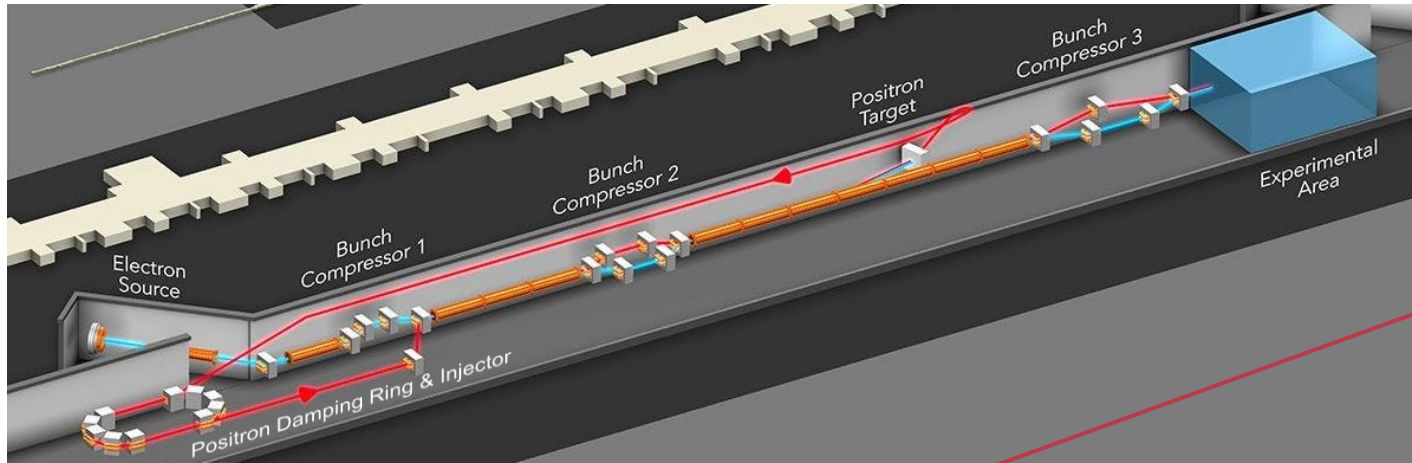
# FACET-II Addresses Key Needs for a Plasma-Based Collider

P5 Town Hall

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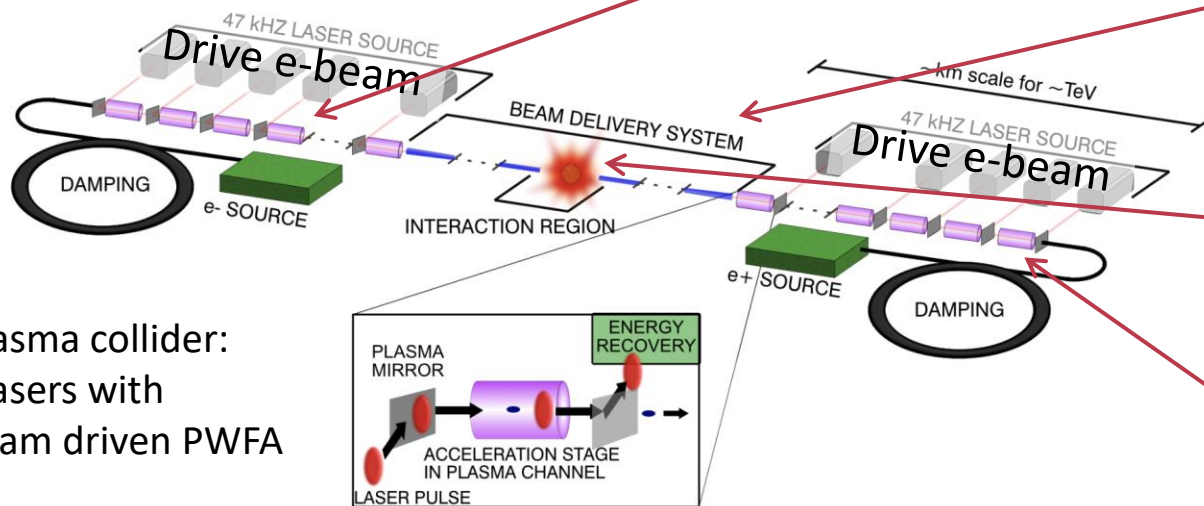
Doug Storey/ Associate Staff Scientist / FACET-II  
May 4, 2022

# FACET-II National User Facility



FACET-II provides uniquely high intensity, multi-GeV electron beams for investigations into:

1. High gradient, efficient acceleration through plasma wakefield acceleration
2. Decreased length of the beam delivery system via plasma lenses
3.  $\gamma$ - $\gamma$  collider physics through non-linear Compton scattering experiments
4. Positron plasma wakefield acceleration (with upgrade)

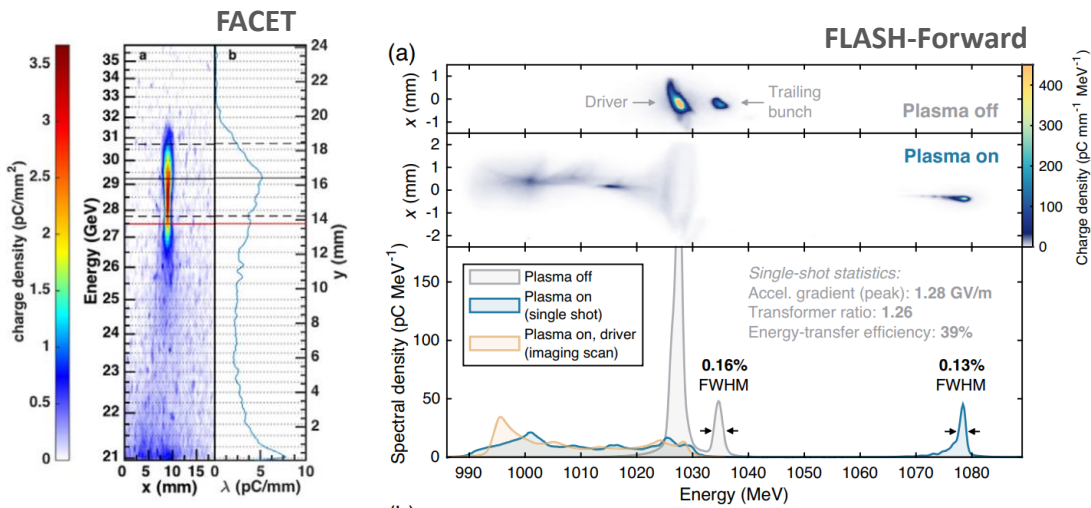


Laser driven plasma collider:  
Replace drive lasers with  
e-beams for beam driven PWFA

# FACET-II addresses key research topics for linear colliders

E300 will demonstrate a **single stage of a plasma linear collider** with:

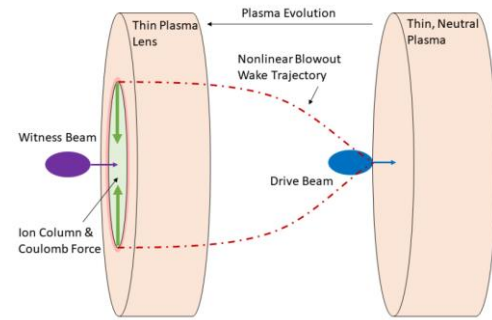
- Multi-GeV/m acceleration
- Low energy spread
- Minimal emittance growth
- >40% energy transfer efficiency with full energy depletion of driver



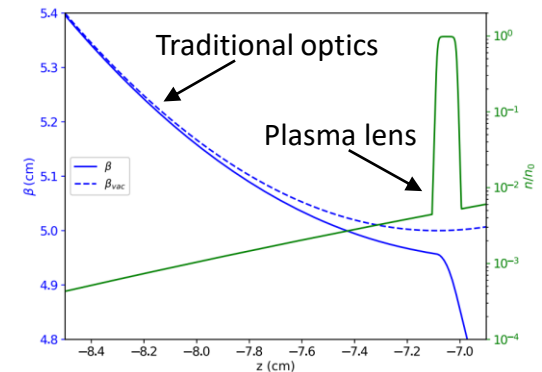
M. Litos, *et al.*, PPCF (2017)

C. Lindstrom, *et al.*, PRL (2021)

E308 is investigating the **Underdense Passive Plasma Lens** for application in a compact BDS

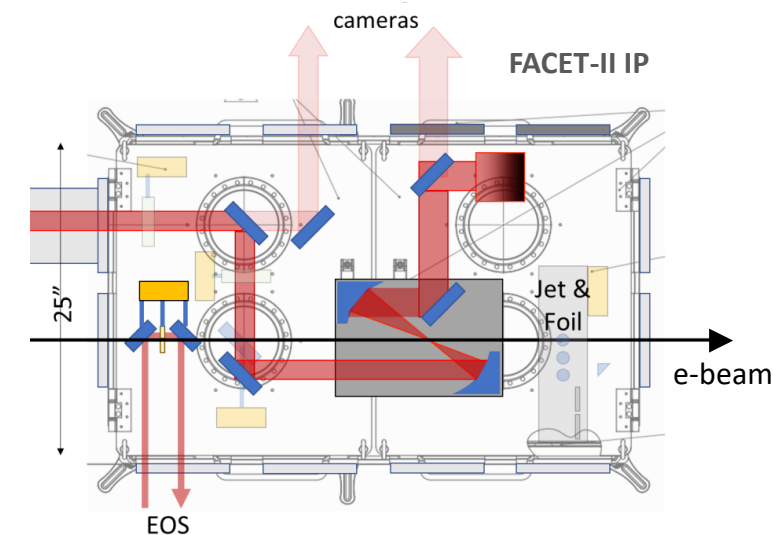


G. White, *et al.*, Jol (2022)



C. Doss, *et al.*, PRAB (2019)

E320 probes strong field QED through boosted electron-photon collisions

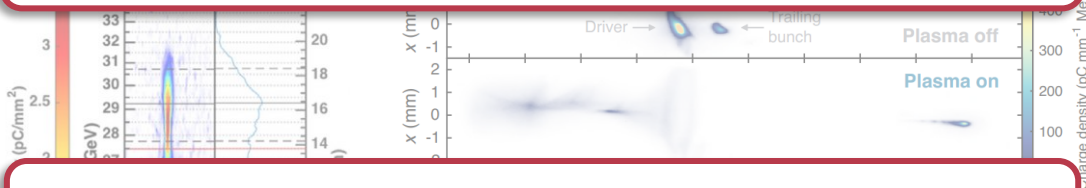


# FACET-II addresses key research topics for linear colliders

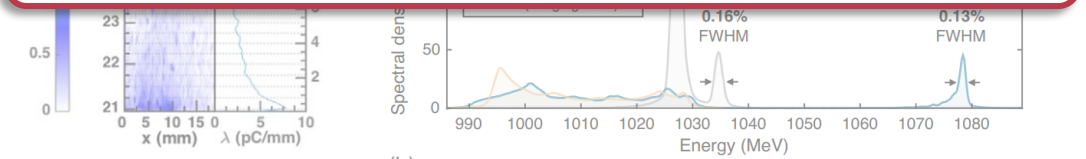
E300 will demonstrate a single stage of a plasma linear collider with:

- Multi-GeV/m acceleration
- Low energy spread
- Minimal emittance growth
- >40% energy transfer efficiency with full energy depletion of driver

Single stage of PWFA accelerator



Positron PWFA possible with facility upgrades

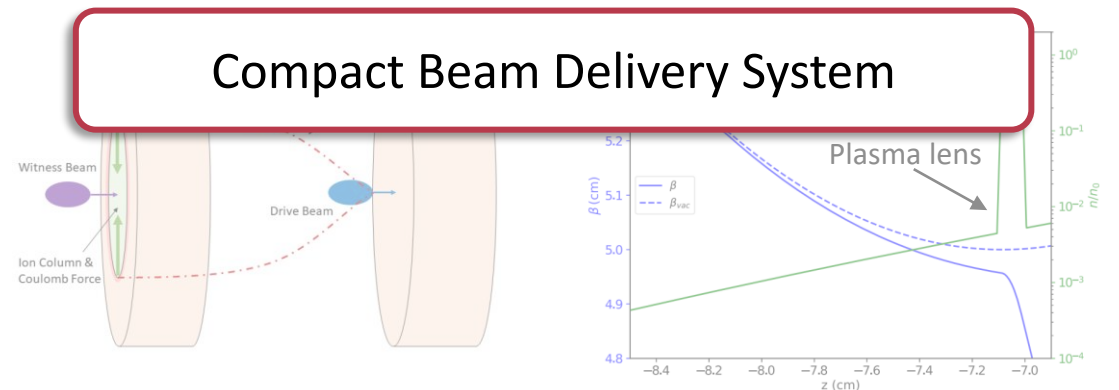


M. Litos, *et al.*, PPCF (2017)

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E308 is investigating the Underdense Passive Plasma Lens for application in a compact BDS

Compact Beam Delivery System



G. White, *et al.*, Jol (2022)

C. Doss, *et al.*, PRAB (2019)

E320 probes strong field QED through boosted electron-photon collisions

Gamma-gamma collider physics

