



FACET II PAC (ZOOM) Meeting OCT 26-29th 2020

E300 , Progress, Status and Plans for first Experiments in 2021

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1.1: What are the science goals: definition of success and target time for each goal

The Grand Science Goal is to reach the beam parameters needed of a single stage of a future linear collider as far as FACET II infrastructure will allow.



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|--|--------------|
| 1 Significant energy depletion of the drive bunch with bulk of the particles fully energy depleted | Year 1 |
| 2 Efficient (>30%) energy extraction from the wake by the trailing bunch while close to doubling it's energy | Year 1 and 2 |
| 3 Understand the conditions for optimum beam loading to minimize the energy spread | Year 2 |
| 4 Understand and optimize the beam matching for emittance preservation at 10 micron or less level | Year 2 and 3 |
| 5 Quantify the extent of transverse BBU or hosing instability | Year 3 |
| 6 Perform preliminary experiments for next set of pressing issues | Year 3 |

Experimental readiness



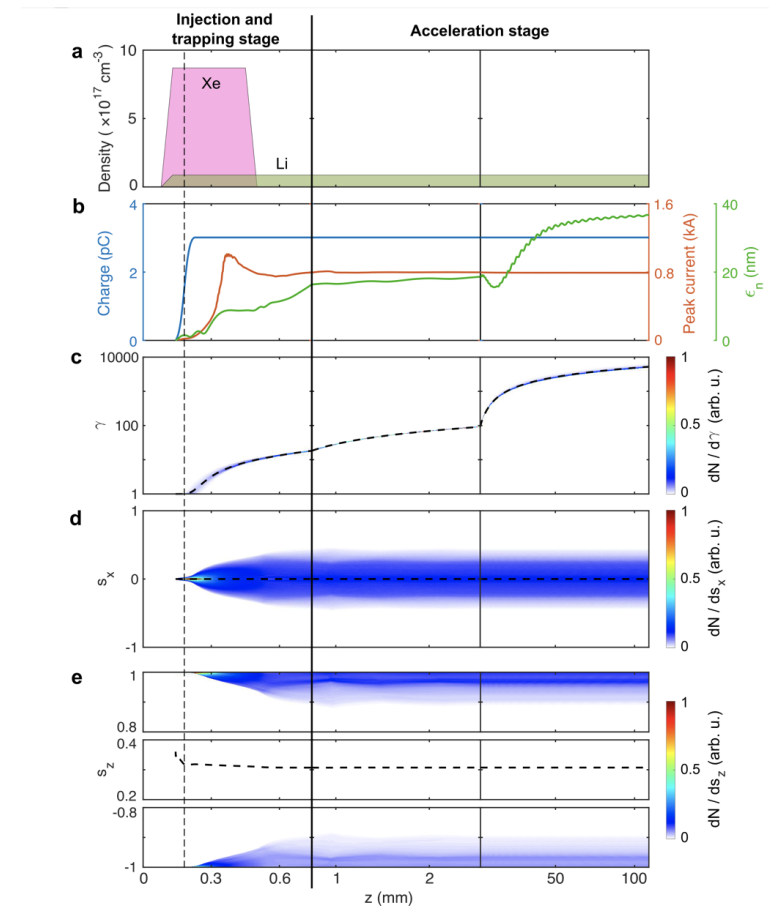
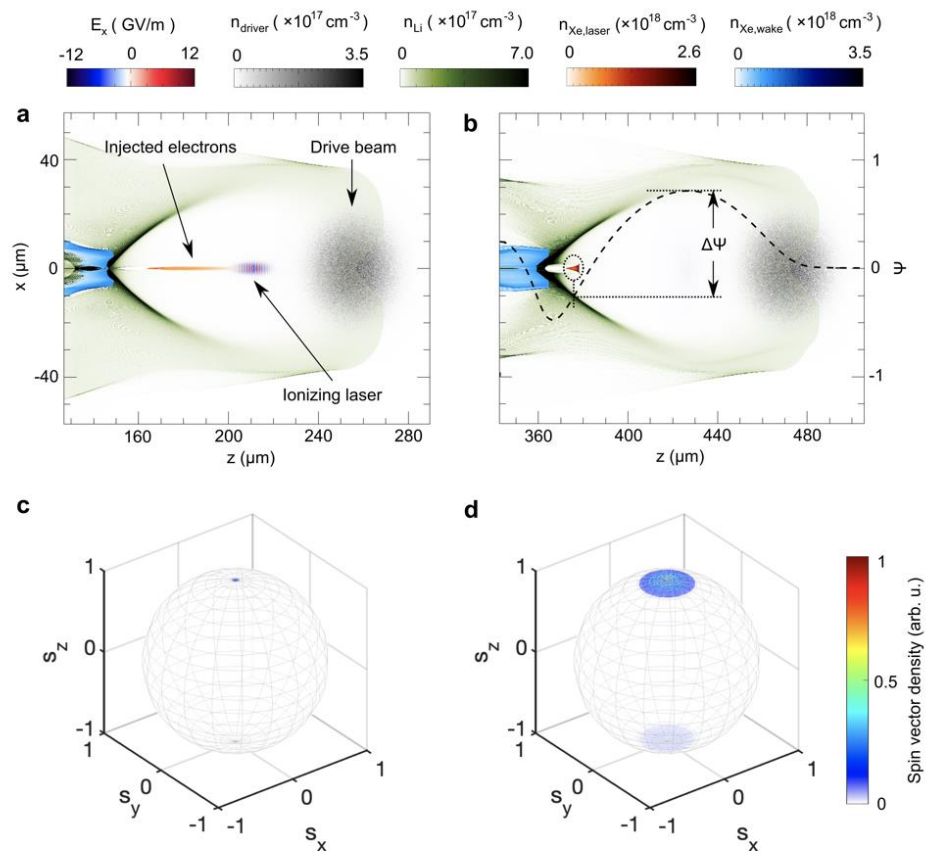
- i) Experimental timeline: Feb. 2021- June 2021
- ii) Experimental design: Very similar to E200. Details of the high and low resolution spectrometers, EOS, positioning of the TCAV are different.
- iii) Date installation plan: The experiment will be ready to go when the Li oven is substituted in the place of the dummy tube in January 2021.
- iv) Ready for experimental safety review: Jan15th 2021
- v) Ready for installation: January 5th 2021
- vi) Ready for commissioning: Feb. 15th 2021 once we settle on whether we will employ the Be foil barrier or go with differential pumping. beam requirements: During Feb. we only need the drive bunch to check out wake excitation, energy loss, drive bunch stability etc.
- vii) First science- beam requirements : Drive (1.5-2 nC, 20-30 KA) and trailing beam (0.5-0.6 nC , 10-12 KA) separated by 150 um with trailing bunch focused with a beta star of 5-10 cm.

2nd phase of the program:

- i) Prerequisites: Understanding the performance of the 1st phase of experiments
- ii) Dates: 3-3week runs or 4- 2 week runs
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- iii) experimental observables: Efficient (>30%)energy extraction from the wake by the trailing bunch while close to doubling it's energy
- Understand the conditions for optimum beam loading
- to minimize the energy spread
Understand and optimize the beam matching for
- emittance preservation at 10 micron or less level

2.2: potential future evolution of the experiment beyond what was presented to PAC

- Spin polarized electron beams:

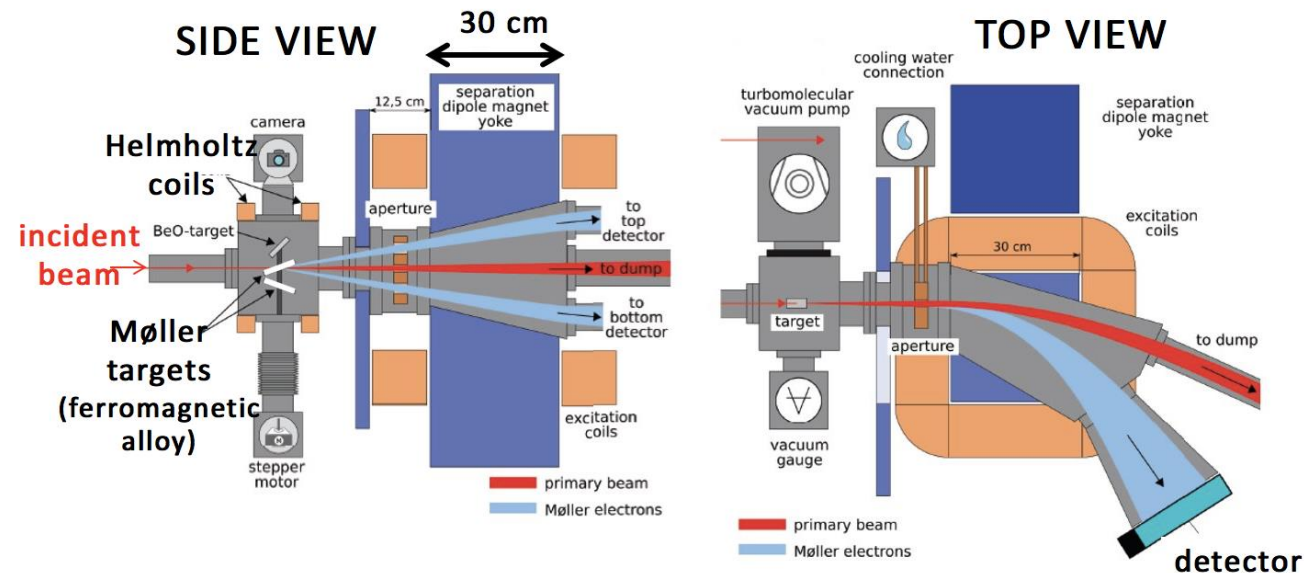


2.3: what are desired facility upgrades

- A positron source and damping ring are needed beyond E300
- The Moller scattering spectrometer modified to look at 1-2 GeV electrons

C. Møller, *Ann. Phys. (Leipzig)* **14**, 532 (1932).

T. Bahlo *et al.*, "Design of a very compact Møller polarimeter for the Superconducting Darmstadt LINAC," *Proc. Int. Beam Instrum. Conf. (IBIC 2016)*



Backup slides: Collaborations

- UCLA
- SLAC
- U. Colorado
- LOA
- Fermilab
- Stony Brook

Backup slide 2: Publications, Students

- There are at present no experimental publications from E300. There are numerous other publications on work supported by the DOE-HEP.
- Students involved: Hiroki Fujji
- A new student Audrey Farrell is interested in this work. She is currently taking classes.
- Three postdocs- Chaojie Zhang, Nie Zan and Yipeng Wu are going to be the main drivers of the experiments from UCLA.
- We expect active participation of all our collaborators in the expt.