

Recent progress of laser plasma physics and advanced accelerator research at Tsinghua University

Wei Lu*

Tsinghua University, Beijing 100084 China

**weilu@tsinghua.edu.cn*

The recent progress of L2PA (Laboratory of Laser Plasma Physics and Advanced Accelerator Technology) at Tsinghua University will be presented. On experimental results, several experiments will be reported: (1) 10-40MeV high quality electron beams can be generated through controlled self-injection using a 5TW laser, and under proper conditions low relative energy spread ($<1\%$) and very low absolute energy spread (0.18MeV) can be achieved. (2) Using a 50TW laser at the joint experimental platform of NCU, 250-435MeV high quality electron beams with low energy spread (2-5%) have been obtained; (3) using 70MeV electron beams generated by a LWFA as a probe, we have successfully demonstrated the electron snapshot of wakefield structure, and measured wakefield dynamics on a density ramp[1]; (4) Using a plasma dechirper to reduce the energy spread of electron beams has been demonstrated.

On theory and simulation, several ideas on how to obtain high quality electron beams with extremely high brightness through wakefield acceleration will be discussed[2]. Furthermore, theoretical model of the phase space dynamics of ionization injection [3] and phase space matching for staging accelerator components using longitudinally tailored plasma profiles will also be discussed[4].

References

- [1] C. J. Zhang, et al., submitted to PRL
- [2] F. Li et al., Phys. Rev. Lett. 111, 015003 (2013)
- [3] X. L. Xu et al., Phys. Rev. Lett. 112, 035003 (2014)
- [4] X. L. Xu et al., Phys. Rev. Lett. 116, 124801 (2016)