Contribution ID: **178** Type: **not specified**

Adiabatic plasma lens designs for the final focus of TeV electrons

The successful operation of future e+ e- linear colliders (LC) critically relies on the ability to tightly focus beams at the interaction point to achieve high luminosities. With spot sizes expected to reach the nanometer scale in TeV LC, traditional beam delivery systems face challenges due to chromatic effects and the requirement of small emittance. To overcome these challenges, the concept of adiabatic plasma lenses for the electron arm of the collider has emerged as a potential solution. In an azimuthally symmetric passive adiabatic plasma lens, a plasma wave wake is excited by a particle beam and a trailing beam surfs on the wake, experiencing a linear focusing force of $m\omega_p^2 r/2$, which is proportional to the plasma density. An adiabatic plasma upramp is designed so that the focusing force on the trailing beam slowly increases during propagation. However, the tightly focused beam of LC can induce ion motion within the beam, an aspect that has not been extensively investigated in previous studies of adiabatic lenses. We propose designs of adiabatic plasma lens for final focus of the electron arm of 2TeV-15TeV COM LC using the advanced simulation tools, QuickPIC with adaptive mesh refinement and QPAD. Furthermore, we show that ion motion on the trailing beam will increase the strength of the focusing force, which can relax the stringent emittance requirements for the LC design. Additionally, we examine how an asymmetric drive beam can add asymmetry to the witness beam, thereby possibly reducing beamstrahlung during e-e- or e+e- collision.

Working group

WG7 : Linear Colliders

Primary authors: SU, Qianqian (University of California, Los Angeles); HILDEBRAND, Lance (University of California, Los Angeles); ZHAO, Yujian (University of California, Los Angeles); AN, Weiming (Beijing Normal Univeristy); LI, Fei (Tsinghua University); DALICHAOUCH, Thamine (UCLA Physics and Astronomy Department); ALVES, Eduardo (University of California, Los Angeles); MORI, Warren (University of California Los Angeles)

Presenter: SU, Qianqian (University of California, Los Angeles)

Session Classification: WG7