aac **24** *ADVANCED ACCELERATOR CONCEPTS*

A Chicagoland meeting of the global Advanced Accelerator Concepts community

Contribution ID: **100**   Type: **not specified**

Demonstration of Longitudinal Focal Stabilization on 100 TW Laser-Plasma Accelerator

Laser-plasma accelerators (LPAs) offer an attractive alternative to conventional accelerators, enabling the acceleration of high-brightness electron beams to ultra-relativistic energies using compact, table-top setups. However, LPAs and their applications are plagued by intrinsic shot-to-shot instability largely attributed to fast fluctuations (>1 Hz) and long-term drifts (<1 Hz) in the driving laser system. Specifically, fluctuations in the final focus longitudinal position result in correlated instability in LPA electron beam qualities, particularly for targets with precision tailored longitudinal profiles. We present a scheme for active stabilization of the longitudinal focal position for a 100 TW laser system, which involves noninvasive wavefront monitoring of the unamplified kHz pulse train and correction implementation via an upstream telescopic lens on millisecond timescales. This approach has demonstrated marked improvements in long-term LPA operation and shot-to-shot stability in terms of generated charge quantity and electron beam spectral content.

Working group

WG5 : Beam sources, monitoring and control

Primary author: JENSEN, Kyle (Lawrence Berkeley National Lab)

Co-authors: BARBER, Sam (LBNL); COLEMAN, Stephen (Radiasoft LLC); COOK, Nathan (RadiaSoft); EDE-LEN, Jonathan (RadiaSoft LLC); Dr EINSTEIN-CURTIS, Joshua (RadiaSoft); Mr BERGER, Curtis (Lawrence Berkeley National Lab); Dr DOSS, Christopher (Lawrence Berkeley National Lab); Mr KOHRELL, Finn (Lawrence Berkeley National Lab); GONSALVES, Anthony J. (Lawrence Berkeley National Laboratory); OSTERHOFF, Jens (LBNL); SCHROEDER, Carl (Lawrence Berkeley National Laboratory); ESAREY, Eric (LBNL); VAN TILBORG, Jeroen (LBNL)

Presenter: JENSEN, Kyle (Lawrence Berkeley National Lab)

Session Classification: WG5