Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Controlled Electron Injection into a Laser-Wakefield Accelerator using a Long-Wavelength Single-Cycle Precursor JIHOON KIM, TIANHONG WANG, School of Applied and Engineering Physics, Cornell University, Ithaca, NY, USA, VLADIMIR KHUDIK, Department of Physics and Institute of Fusion Studies, University of Texas, Austin, TX, USA, GENNADY SHVETS, School of Applied and Engineering Physics, Cornell University, Ithaca, NY, USA — Single cycle laser pulse propagating inside a plasma causes controllable asymmetric plasma electron expulsion from laser according to laser carrier envelope phase (CEP) and forms an oscillating plasma bubble [1]. Bubble's transverse wakefield is modified, exhibiting periodic modulation. Injection scheme for a laser wakefield accelerator using such single cycle low frequency laser pulse and a many cycle high frequency laser pulse is proposed. While the single cycle pulse drives the bubble, background plasma electrons can be periodically trapped because of modified wakefield. The single cycle pulse quickly loses energy, after which the many cycle pulse generates a stable wakefield. Injection is terminated, and electrons are accelerated to higher energy. By tuning the initial CEP of the single cycle laser pulse, injection dynamics can be modified independently of the many cycle pulse, enabling control of electron bunches' charge and spatiotemporal profile. [1] E.N.Nerush and I.Yu.Kostyukov Phys.Rev.Lett. 103,035001(2009)

Jihoon Kim
Cornell University

Date submitted: 10 Jul 2020 Electronic form version 1.4