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Generation of high quality electron beams via ionization injection in a plasma wakefield accelerator[1] NAVID VAFAEI-NAJAFABADI, CHAN JOSHI, UCLA, E217 SLAC COLLABORATION — Ionization injection in a beam driven plasma wakefield accelerator has been used to generate electron beams with over 30 GeV of energy in a 130 cm of lithium plasma. The experiments were performed using the 3 nC, 20.35 GeV electron beam at the FACET facility of the SLAC National Accelerator Laboratory as the driver of the wakefield. The ionization of helium atoms in the up ramp of a lithium plasma were injected into the wake and over the length of acceleration maintained an emittance on the order of 30 mm-mrad, which was an order of magnitude smaller than the drive beam, albeit with an energy spread of 10-20%. The process of ionization injection occurs due to an increase in the electric field of the drive beam as it pinches through its betatron oscillations. Thus, this energy spread is attributed to the injection region encompassing multiple betatron oscillations. In this poster, we will present evidence through OSIRIS simulations of producing an injected beam with percent level energy spread and low emittance by designing the plasma parameters appropriately, such that the ionization injection occurs over a very limited distance of one betatron cycle.

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