



Contribution ID: 132

Type: **not specified**

## Latest Results on PWFA Experiments from FACET-II [BALLROOM]

*Thursday, 25 July 2024 09:30 (30 minutes)*

FACET-II is a national user facility that offers a unique capability for developing advanced acceleration and coherent radiation generation techniques using high-energy electron beams. In this talk, we will present the latest results from plasma wakefield acceleration (PWFA) experiments at FACET-II, focusing on the following topics. First, we provide evidence of energy depletion of the 10 GeV drive beam and efficient energy transfer from the beam to the wake, in both beam-ionized and laser-preionized plasmas, which is a crucial stepping stone towards achieving high energy transfer efficiency from the drive to the witness bunch in the ultimate two-bunch PWFA configuration. We will also show examples of machine-learning-enabled beam tuning to increase drive beam density, thereby enhancing energy transfer efficiency. Next, we present results on generating high-energy, low-emittance beams via downramp and ionization trapping in PWFA. Using density downramp injection, we achieve the generation of electron bunches exceeding 20 GeV with small energy spread and emittance. Additionally, we show the generation of multi-GeV, multi-color electron beams via ionization injection, resulting from periodic injection induced by betatron oscillations of the drive bunch. Finally, we will discuss the first experimental attempts at beam matching to a lithium density upramp and share preliminary results from the two-bunch PWFA experiment.

Acknowledgement: The FACET-II Facility at SLAC National Accelerator Laboratory and the work at UCLA has been funded by the U.S. DoE Office of HEP.

### Working group

invited speaker

**Primary author:** ZHANG, Chaojie (UCLA)

**Co-authors:** STOREY, Doug (SLAC National Accelerator Laboratory); Dr SAN MIGUEL CLAVERIA, Pablo (GoLP/Instituto de Plasmas e Fusao Nuclear); MARSH, Ken (University of California Los Angeles); Prof. MORI, Warren (University of California Los Angeles); Prof. ADLI, Erik (University of Oslo); Prof. AN, Weiming (Beijing Normal University); Dr ARINIELLO, Robert (SLAC National Accelerator Laboratory); CAO, Gevy (University of Oslo); CORDE, Sebastien (Ecole Polytechnique); Dr DALICHAOUCH, Thamine (University of California Los Angeles); EMMA, Claudio (SLAC National Laboratory); Dr GESSNER, Spencer (SLAC National Accelerator Laboratory); HANSEL, Claire (University of Colorado Boulder); Dr KNETSCH, Alexander (SLAC National Accelerator Laboratory); LEE, Valentina (University of Colorado Boulder); Dr LI, Fei (Tsinghua University); Prof. LITOS, Mike (University of Colorado Boulder); Dr O'SHEA, Brendan (SLAC National Accelerator Laboratory); YOCKY, Gerry (SLAC National Accelerator Laboratory); ZAKHAROVA, Viktoriia (LOA, ENSTA Paris, CNRS, Ecole Polytechnique); HOGAN, Mark (SLAC National Accelerator Laboratory); JOSHI, Chan (UCLA)

**Presenter:** ZHANG, Chaojie (UCLA)

**Session Classification:** Plenary