

Sub-relativistic Alternating Phase Focusing Dielectric Laser Accelerators

Monday 18 March 2024 11:00 (30 minutes)

We present our results for the design, fabrication, and testing of silicon-based, sub-relativistic Dielectric Laser Accelerators (DLAs) which use optical near fields to accelerate and confine electrons over extended distances. We describe how Alternating Phase Focusing (APF) lattices are incorporated to longitudinally/transversely focus/defocus electrons in an alternating fashion based on electron-laser interaction phase. Alternating between $\pm 60^\circ$ off-crest synchronous phases enables us to operate at half the peak acceleration gradient while also imparting strong confinement forces, ultimately extending interaction lengths up to $708\text{ }\mu\text{m}$ and achieving energy gains up to $23.7 \pm 1.07\text{ keV}$ FWHM. We also highlight future directions for three-dimensional confinement, bunching, and quantum behavior of electrons in DLAs.

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Session Classification: DLA - Experiments