Contribution ID: **240** Type: **Oral contribution**

Coherent Nanophotonic Electron Accelerator

Tuesday, 19 September 2023 17:05 (20 minutes)

In 2013 the concept of dielectric or nanophotonic laser acceleration was experimentally demonstrated. Rather simple dielectric gratings with their periodicity matched to the electron velocity, in the same manner as the original Widerøe linear accelerator almost century ago, only driven with light. Now, a decade later, we can demonstrate what one might call a dielectric laser accelerator, namely combined coherent acceleration and guiding. The dielectric accelerator is driven by femtosecond laser pulses, and the role of the RF cavities of conventional accelerators is taken over by microscopic dielectric pillars, which generate the driving nearfield once illuminated by the pulsed laser beam. The amplitudes of these nearfields can be substantial, exceeding 1 GV/m, which drove DLA research for the past decade. The design of these pillars, i.e. their placement and dimensions, allows us to generate an optical mode matched to the propagating electron. In addition, we designed the structure to employ alternating phase focusing as a method to focus the electron beam transversally while maintaining acceleration. We will show guiding and acceleration of electrons from an initial energy 28.4 keV all the way to 40.7 keV, a gain of 12.3 keV over 0.5 mm distance in just 225 nm wide channel.

Primary author: CHLOUBA, Tomáš (Friedrich-Alexander University Erlangen-Nurnberg)

Co-authors: Mr LITZEL, Julian (Friedrich-Alexander University Erlangen-Nurnberg); Mr BRÜCKNER, Leon (Friedrich-Alexander University Erlangen-Nurnberg); HOMMELHOFF, Peter (University of Erlangen and Max Planck Institute for Quantum Optics); SHILOH, Roy (FAU Erlangen-Nürnberg); Ms KRAUS, Stefanie (Chair of laserphysics (FAU))

Presenter: CHLOUBA, Tomáš (Friedrich-Alexander University Erlangen-Nurnberg)

Session Classification: WG4: High gradient vacuum structures

Track Classification: WG4: High gradient vacuum structures