Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Webinar

Ultrashort Collimated High Energy Electron Beam: A Tabletop Approach

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Ultrashort, high-power laser–plasma interaction offers a compact alternative to conventional electron accelerators for generating high-energy electrons. This thesis investigates the interaction of high-power laser pulses with microdroplets to produce bright electron beams with micron-scale source size at a repetition rate of 1 kHz. Recent developments from our laboratory have demonstrated that structural modification of microdroplets using a laser prepulse can enable the generation of relativistic-energy electrons, even at sub-relativistic laser intensities.

In this talk, I will present further experimental studies aimed at understanding the underlying physics. In particular, we establish that the anomalous generation of hot electrons is driven by the two-plasmon decay instability. Next, we leveraged the impact of diverse laser parameters on the energies of emitted electrons and emission propensity to unveil the pivotal factors critical to the generation of hot electrons. This study paves the way for scaling up electron emission and developing a compact, tabletop source of high-energy electrons. Additionally, laser plasma generated electrons hold promise for time-resolved measurements. I will present our in-house developed streak camera system, designed to measure the pulse width of ultrashort, polyenergetic electron bunches. Finally, I will discuss our efforts to control electron beam divergence using dielectric capillaries to enable efficient beam transport.

Monday, Jun 16th 2025

16:00 Hrs