



11/06/2026, 11:00 a.m.

IFIN-HH/ELI-NP Training and Conference Center
Sydney Benjamin Galès / main conference hall

Towards dephasingless LWFA

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We present recent numerical and experimental studies of flying-focus laser-wakefield accelerators (LWFAs) at the Weizmann Institute. Flying-focus laser pulses are created by combining spatio-temporal couplings with an axiparabola, a mirror that produces an extended focal region. Wakefields driven by such pulses have a tunable phase velocity and offer a potential route to overcoming electron dephasing, a key limitation in scaling LWFAs to higher energies. We combine direct imaging using femtosecond relativistic electron microscopy (FREM) with optical and particle-in-cell (PIC) simulations to study the wakefield structure in detail.

Close correspondence between the simulations and the experimental results gives us confidence that the simulations capture the key physical effects. We show that these wakefields differ significantly from conventional parabola-driven wakefields and evolve strongly along the focal line. We present the first electrons accelerated in a flying-focus wakefield with velocity controlled through the pulse-front curvature. Statistical analysis and PIC simulations show that this leads to measurable changes in the accelerated electron energy, consistent with partial compensation of dephasing. While the focus of the seminar is flying-focus wakefields, I will also highlight several related research directions.