

Injectors and Beam Physics for Future Accelerators

Monday, 14 September 2026 - Tuesday, 15 September 2026

SLAC

Scientific Programme

As an outcome of this workshop, we will produce a white paper that defines the needs of injectors for future colliders and high-brightness light-source programs, sets quantitative performance targets, and outlines an experimental path forward, including required test-facilities and paths for AI/ML-enabled diagnostics and controls.

The sessions will therefore be organized to address these cross-cutting needs for the accelerator community:

High intensity beams for colliders

This session focuses on high-charge, GeV-scale injectors that enable top-up or swap-out injection strategies for future colliders (EIC, FCC-ee) and related facilities. We will cover the required injector performance by planned machines, identify the validation studies required to demonstrate these techniques at scale, and additional collider related research topics such as halo diagnostics and control in rings.

High brightness beams for light sources and other applications

This session addresses the generation and preservation of ultralow-emittance beams to boost phase-space density for high brightness applications such as light sources. Topics will include new developments in high gradient injectors and plasma wakefield injection techniques; the generation of high peak current (MA-class) beams; and the mitigation of space charge, coherent radiation effects, wakefields, and other collective instabilities.

Diagnostics and novel tools

This session develops the measurement and control toolkit needed to reach the above goals. Topics include femtosecond/attosecond timing and synchronization; full 6D phase-space diagnostics with nanometer and attosecond resolution and high dynamic range; and diagnostics suitable for kA–MA-class beams. We will also cover AI/ML-enabled diagnostics and predictive control.