A Chicagoland meeting of the global Advanced Accelerator Concepts community

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Advanced Accelerator Concepts and the 2023 P5 Report [BALLROOM]

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Advanced accelerator concepts have potential to enable future colliders. Recent progress includes multi-GeV acceleration, positron acceleration, strong structure loading and focusing, staging of two modules, beam shaping for efficiency, high gradient structures and greatly improved beam quality which recently enabled wakefield-based FELs.

The recent 2023 Particle Physics Project Prioritization (P5) report describes priorities to guide work over the coming decade. Generic R&D is important to extend the reach of accelerators. This is important to future colliders and stewardship of nearer-term applications with broad benefit. R&D attracts high-level talent important to develop machine design and projects.

To follow the HL-LHC and a Higgs Factory, R&D should be pursued towards the 10 TeV parton center of momentum (pCM) scale by colliding muons or protons, or possibly an electron-positron (or gg) collider based on wakefield technology. To make an informed decision — one we hope to make within the next 20 years—one or more concept must reach technical maturity, allowing reliable estimation of cost and risk.

Wakefield collider concepts are in the early stages of development, with conceptual parameter sets developing. An end-to-end design concept, including cost scales, with self-consistent parameters throughout is an important next step requiring focus and engagement with the collider and high energy physics communities. Experiments and test facilities should be used to demonstrate acceleration and beam requirements of a stage for a future collider based on wakefield technology, operation with two linked multi-GeV stages, and methods to reduce cost and risk, guided by collider R&D.

Working group

invited speaker

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