7th European Advanced Accelerator Conference

EAAC2025

Contribution ID: **673** Type: **Oral contribution**

Toward a Multi-TeV Linear Collider Based on Structure Wakefield Acceleration

Beam-driven structure wakefield acceleration represents a compelling technology for future energy-frontier machines: it can accelerate any particle species and is implemented in two primary configurations—two-beam acceleration (TBA) and collinear wakefield acceleration (CWA). The TBA approach has demonstrated exceptional performance, with accelerating gradients approaching 500 MV/m achieved experimentally, offering the potential for dramatically more compact high-energy accelerators. This contribution discusses the use of the TBA implementation as a fundamental building block for a multi-TeV scale e^+/e^- collider, examining the technological progress supporting such a concept, remaining challenges, and the pathway toward realizing next-generation particle physics discoveries at unprecedented energy scales.

Author: PIOT, Philippe (Argonne National Laboratory)

Presenter: PIOT, Philippe (Argonne National Laboratory)

Session Classification: PS9: Particle physics applications: proposals, ESPP input, sustainability

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