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Advances in plasma-based positron acceleration

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Plasma-based acceleration offers a promising pathway toward compact, high-gradient accelerators for next-generation particle colliders and advanced light sources. While substantial progress has been achieved for electron beams, the production of collider-quality positron beams remains a formidable challenge. This presentation will outline the stringent beam-quality requirements for future electron–positron colliders, followed by a discussion of multiple positron acceleration regimes in hollow plasma channel, uniform plasma, and other configurations. Particular emphasis will be placed on beam quality optimization, acceleration stability, and the beam–plasma interaction physics. Theoretical studies indicate that high-quality wakefield positron acceleration holds strong potential for integration into future collider designs. Finally, recent progress in proof-of-principle experiments at the Institute of High Energy Physics will be presented.

Author: ZHOU, Shiyu (IHEP)

Co-author: Prof. LU, Wei (IHEP)

Presenter: ZHOU, Shiyu (IHEP)

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