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Energy and brightness-boosted electron beams from plasma-based accelerators

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Recent advancements in plasma-based accelerators have ignited “the race for wakefield-driven FELs” [1]. However, FELs at soft and hard X-ray wavelengths require electron beams with dramatically improved 6D brightness. The author presents comprehensive strategies towards generating ultra-high 6D brightness electron beams in beam-driven plasma wakefield acceleration (PWFA). These ultra-high 6D brightness electron beams may enable novel photon and fundamental science modalities [2]. One direct ramification of this new class of electron beams is a blueprint for an ultra-compact attosecond-Angstrom class FEL [3]. Further, the author will explain how these high-brightness PWFA stages can enhance the capabilities and modalities of existing and future linac-based FELs.

[1] Graydon, O. Nat. Photon. 16, 750–751 (2022).

[2] Habib, AF et al. Annalen der Physik 535.10,p. 2200655 (2023)

[3] Habib, AF et al. Nat. Commun. 14, 1054 (2023)

Footnotes

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