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Pathways & progress to ultrabright pulses from plasmas

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Hybrid combinations of lasers and electron beams allow LWFA->PWFA and plasma photocathodes to be realized. This is a pathway to ultrabright electron and photon pulses. Experimental progress on hybrid LWFA->PWFA, and on plasma photocathodes driven by linac-PWFA, and now also by the hybrid LWFA->PWFA approach, will be presented. Intrinsically synchronized, ultrabright electron and photon pulses e.g. via X-FEL from compact, all-optical setups then enable unique experimental constellations and applications of ultraintense IR–e-beam–X-ray interaction.

[1] Kurz, Heinemann et al., Demonstration of a compact plasma accelerator powered by laser-accelerated electron beams, Nat. Comm. 2021
[2] Deng, Karger et al., Generation and acceleration of electron bunches from a plasma photocathode, Nat. Phys. 2021
[3] Habib et al., Attosecond-Angstrom free-electron-laser towards the cold beam limit, Nat. Comm. 2023

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