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An ep collider based on proton-driven plasma wakefield acceleration

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Recent simulations have shown that a high-energy proton bunch can excite strong plasma wakefields and accelerate a bunch of electrons to the energy frontier in a single stage of acceleration. Using this scheme could lead to a future ep collider using the protons from the LHC and a compact electron accelerator up to an energy of 100 GeV with a length of about 170 metres. The parameters of such a collider are discussed as well as conceptual layouts within the CERN accelerator complex. The physics of plasma wakefield acceleration will also be introduced, with the AWAKE experiment, a proof of principle demonstration of proton-driven plasma wakefield acceleration, briefly reviewed, as well as the physics possibilities of such an ep collider.

Primary authors: AIMIDULA, Amir (Cockcroft Institute / University of Liverpool); Prof. WELSCH, Carsten (Cockcroft Institute / University of Liverpool); WING, Matthew (UCL); METE, Oznur (University of Manchester, Cockcroft Institute); MANDRY, Scott (University College London, Max-Planck-Institut für Physik); CHATTOPADHYAY, Swapan (Cockcroft Institute, UK); XIA, guoxing (University of Manchester)

Presenter: WING, Matthew (UCL)

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