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AWAKE : A proton-driven plasma wakefield acceleration experiment at CERN

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The AWAKE Collaboration has been formed in order to demonstrate proton-driven plasma wakefield acceleration for the first time. This technology could lead to future colliders of high energy but of a much reduced length compared to proposed linear accelerators. The CERN SPS proton beam in the CNGS facility will be injected into a 10 m plasma cell where the long proton bunches will be modulated into significantly shorter micro-bunches. These micro-bunches will then initiate a strong wakefield in the plasma with peak fields above 1 GV/m that will be harnessed to accelerate a bunch of electrons from about 20 MeV to the GeV scale within a few meters. The experimental program is based on detailed numerical simulations of beam and plasma interactions. The main accelerator components, the experimental area and infrastructure required as well as the plasma cell and the diagnostic equipment are discussed in detail. First protons to the experiment are expected at the end of 2016 and this will be followed by an initial 3-4 year experimental program. The experiment will inform future larger-scale tests of proton-driven plasma wakefield acceleration and applications to high energy colliders.

Summary

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