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AWAKE: the proton-driven plasma wakefield accelerator experiment at CERN

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In order to achieve affordable and compact high-energy particle accelerators, machines with high accelerating gradients are necessary. The beam-driven plasma wakefield accelerator is a novel accelerator technique being developed for this purpose. The AWAKE experiment at CERN is the first proton-driven plasma wakefield accelerator experiment. The experiment relies on seeded self-modulation to transform the 12 cm long, 400 GeV proton bunch from the SPS into a train of bunches spaced by the plasma wavelength (˜ 1mm). The train can then resonantly drive GV/m fields that can be used to accelerate electrons over 10s to 100s of meters. We present experimental results from the first experimental run, including measurements of the proton bunch self-modulation and of 2 GeV energy gain in a 10 meter long plasma cell.

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