

a novel plasma source for beam driven wakefield acceleration

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A proton driven plasma wakefield accelerator (pdpwa) experiment using CERN proton bunches is proposed by the Advanced Wake Field Accelerator (AWAKE) collaboration. 12 cm, 400 GeV CERN proton beam enters a 10 meter long plasma and the transverse selfmodulation instability causes the proton beam to self modulate. The modulated beam behaves as a sequence of microbunches and starts resonantly driving a large wake (\sim GV/m). In this wake a \sim 20 MeV copropagating electron bunch will be injected. The plasma source is a 10 meter long Rubidium vapor which is fully tunnelionized by a laser. There is a strict requirement on the plasma uniformity. For the injected electron bunch to stay in the accelerating and focusing phase of the plasma wake the relative nonuniformity anywhere along the Rb vapor is not to exceed 0.2%. The plasma source developed at the Max Planck Institute for Physics is presented. Rb is confined in a long, 2 cm diameter heated pipe. The required uniformity is satisfied for a range of densities around optimum density of (7×10^{15} cm⁻³). Fast valves provide beam access to the source. The source design, the effect of the valves, the expected neutral and plasma densities will be presented.

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