

## APPLICATIONS OF A PLASMA WAKE FIELD ACCELERATOR

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### *Abstract*

An electron beam driven Plasma Wake-Field Accelerator (PWFA) has recently sustained accelerating gradients above 50 GeV/m for almost a meter. Future experiments will transition from using a single bunch to both drive and sample the wakefield, to a two bunch configuration that will accelerate a discrete bunch of particles with a narrow energy spread and preserved emittance. The plasma works as an energy transformer to transform high-current, low-energy bunches into relatively lower-current higher-energy bunches. This method is expected to provide high energy transfer efficiency (from 30% up to 95%) from the drive bunch to the accelerated witness bunch. The PWFA has a wide variety of applications and also has the potential to greatly lower the cost of future accelerators. We discuss various possible uses of this technique such as: linac based light sources, injector systems for ring based synchrotron light sources, and for generation of electron beams for high energy electron-hadron colliders.

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