

## Channeling 2018



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# Towards Positron Acceleration and High Quality Preservation in Nonlinear Wakefields in Hollow Plasma

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Unlike electrons, it is difficult to accelerate positrons in the blowout regime as the positive charges are quickly expelled away from the bubble by the background ions therein. To obtain an acceptable efficiency, it requires precisely placing the positrons in the narrow region of plasma electrons with a peak density. In addition, the transverse nonlinearity of the accelerating field results in an increase of energy spread inevitably. By introducing a hollow plasma channel, the defocusing ions in the acceleration region for positrons are removed. Furthermore, the steep and negative slope of the accelerating field reduces the resultant energy spread gained in the preceding acceleration dramatically. The emittance of positrons can be preserved as well. This hollow channel also facilitates the focusing of the multiple driving proton bunches. With the huge energies stored in the protons, the positrons can be accelerated to the energy frontier in a single stage.

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