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High energy plasma injector for future electron-positron collider

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The next generation high energy electron-positron collider is crucial for the precision measurements of the Higgs boson and searching new physics beyond the Standard Model. At present, the cost of linear or circular colliders based on traditional radio-frequency accelerators is enormous to meet the requirement for Higgs factory. Advanced accelerator concepts such as the plasma wakefield accelerator (PWFA) can provide acceleration gradient orders of magnitude larger than rf cavities, which may greatly reduce the scale and cost of the facility. However, the state-of-the-art developments for these schemes are still far away from the beam parameters required by the collider. We propose a hybrid electron-positron collider scheme which uses PWFA as a high energy injector for the future collider. The plasma wakefield accelerators greatly boost the energy of the electron and positron beams from the rf accelerators, and then injects them into the collider rings. This combination can effectively reduce the cost of the circular collider and the relatively low requirements of the injector makes it more viable for PWFA. The investigation of this scheme will pave the way for the future plasma based linear colliders.

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