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Plasma acceleration based high energy injector for future circular e^+e^- collider[1] SHIYU ZHOU, YUE MA, Tsinghua University, DOU WANG, CAI MENG, JIE GAO, Institute of High Energy Physics, WEIMING AN, QIANQIAN SU, FEI LI, CHAN JOSHI, WARREN MORI, University of California, Los Angeles, JIANFEI HUA, WEI LU, Tsinghua University — For the past century, tools for exploring high energy physics have been radio-frequency (RF) particle accelerators. The state-of-the-art accelerator Large Hadron Collider costs about $4 billion to construct and is 27km in circumference. Detailed tests of recently discovered Higgs Bosons require a collider with higher energy and will cost much more with the same technology. Plasma based acceleration (PBA) is shown to have acceleration gradients orders of magnitude higher than RF accelerator, able to dramatically reduce the size and cost of future colliders. For next generation circular colliders such as the proposed Circular Electron Positron Collider (CEPC), which collides e^-/e^+ beams of 120GeV, may be greatly enhanced by PBA. We present preliminary results on a 45GeV injector for CEPC that consists of a conventional e^-/e^+ beam source and a single PBA cell. The PBA cells for both electron and positron acceleration are custom-designed, which could also be applied to a future linear collider. The techniques for emittance preservation and energy dechirping are included to optimize beam quality. Detailed simulations show the final results satisfy the requirements proposed in CEPC design report.

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