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**Coherent phase space matching of staging plasma and traditional accelerator using longitudinally tailored plasma structure** XINLU XU, WEI LU, Tsinghua Univ, WARREN MORI, CHAN JOSHI, University of California Los Angeles, MARK HOGAN, SLAC National Accelerator Laboratory — For the further development of plasma based accelerators, phase space matching between plasma acceleration stages and between plasma stages and traditional accelerator components becomes a very critical issue for high quality high energy acceleration and its applications in light sources and colliders. Without proper matching, catastrophic emittance growth in the presence of finite energy spread may occur when the beam propagating through different stages and components due to the drastic differences of transverse focusing strength. In this paper we propose to use longitudinally tailored plasma structures as phase space matching components to properly guide the beam through stages. Theoretical analysis and full 3-dimensional particle-in-cell simulations are utilized to show clearly how these structures may work in four different scenarios. Very good agreements between theory and simulations are obtained.

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