

Abstract Submitted
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Waves for Alpha-Channeling in Mirror Machines ANDREY ZHMOGINOV, NATHANIEL FISCH, Princeton University — Alpha-channeling is a technique for extracting energy from alpha particles and using it to sustain fusion reaction by means of using waves to control the particle dynamics. The rough optimization of the energy transfer efficiency with respect to rf region parameters performed earlier for a mirror machine suggested that up to 60% of alpha particle energy can be redirected to fuel ions. However, the limitations on the wave parameters imposed by plasmas were not previously considered. Using kinetic plasma dispersion relation and assuming quasi-longitudinal, or quasi-transverse wave propagation, we systematically search for modes which can be used to extract alpha particle energy in mirror plasmas. This method is further used to identify such modes in several device designs including the LAPD experiment. Since the damping rate of the suitable modes on fuel ions is small compared to the damping rate on electrons, coupling the identified modes to the waves in the plug is shown to be a mechanism which can potentially increase the effective reactivity of tandem mirrors.

Andrey Zhmoginov
Princeton University

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