

Modified Budden problem associated with an energetic-particle population*

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The main motivation for this work is to investigate what new effects are introduced in standard heating and/or current-drive scenarios when a non-Maxwellian population of energetic particles (e.g., fusion alphas) is taken into account. In particular, we investigate how energy from a negative-energy wave supported by an inverted population of energetic particles can be transferred to a positive-energy wave supported by a bulk-ion species (e.g., IBW or Ion Hybrid) through the intermediary of a magnetosonic wave. To investigate this potentially new form of alpha-channeling process, we construct a modified Budden three-wave model that allows recirculation of energy fluxes. The calculations of the transmission, reflection, and conversion coefficients in this modified Budden problem make use of ray phase-space methods [1] and the modular eikonal approach [2]. Our results show that conversion coefficients to the positive-energy bulk-ion wave can exceed 100%, depending on the propagation characteristics of the three waves.

[1] E. R. Tracy, A. N. Kaufman, and A. J. Brizard, *Phys. Plasmas* **10**, 2147 (2003) and references therein.

[2] Y. M. Liang et al., *Phys. Lett. A* **193**, 82 (1994).

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