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**Nonlinear collision effect on  $\alpha$ -particle confinement in toroidal plasmas** YOSHITADA MASAOKA, SADAYOSHI MURAKAMI, Kyoto University — In helical systems, high-energy particle trajectory is complicated in a three dimensional magnetic configuration and, thus the confinement of alpha particles is one of the critical issues in designing helical reactor. In addition to that, circulating fast ions affect the cross section of the first ion itself. Thus the analysis including the both complicated orbit and nonlinear collision effects are necessary to make clear the  $\alpha$ -particle confinement in heliotropes. In this paper, we study the  $\alpha$ -particle confinement including the collision with various plasma species such as electron, deuterium, tritium, and high-energy  $\alpha$ -particle. We improve the GNET code to take into account the nonlinear collision effect in a heliotrope fusion reactor based on the LHD configuration. We analyze the real and velocity space distributions and the energy and particle loss fraction changing the background plasma parameters, and verify the effects of collision between high-energy particles on the alpha-particle confinement.

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