26aE21P

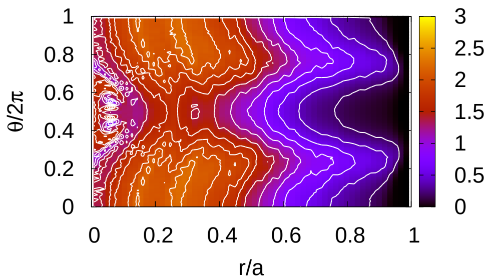
ヘリカルプラズマにおける磁気島存在下の NBI 加熱シミュレーション
NBI heating simulation in the presence of magnetic islands in helical plasmas

山口裕之，村上定義
Hiroyuki YAMAGUCHI and Sadayoshi MURAKAMI

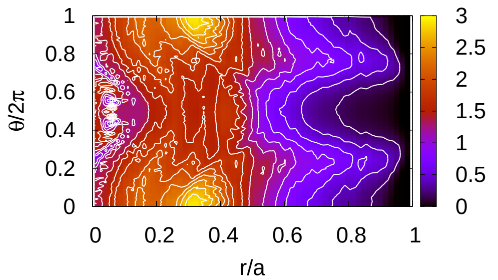
京大工
Department of Nuclear Engineering, Kyoto University

Existence of nested closed magnetic flux surfaces is an essential requirement for a good plasma confinement in toroidal configurations. On the other hand, it is suggested that optimized and controlled magnetic island can have benefit for plasma performances. In the Large Helical Device (LHD) experiments, magnetic island effect and its dynamics in LHD plasmas have been studied applying the resonant magnetic perturbation (RMP) coils [1], and the behaviors such as temperature flattening in the magnetic islands have been observed as in tokamaks. In these experiments three tangential and two perpendicular neutral beam injection (NBI) heating systems are applied. These neutral beams produce energetic ions, which draw variety of passing and trapped orbits more complicated than that in tokamaks. Especially, the confinement of ripple-trapped particles are important for energetic particle confinement in LHD.

In this paper, we study the effect of magnetic islands on the NBI beam ion confinement in LHD plasma. We model the resonant magnetic perturbation as that with a single helicity. Taking into account those magnetic perturbations, we solve the drift kinetic equation for NBI beam ions in 5-D phase space using the GNET-TD code [2], which is based on GNET [3]. The complex guiding-center motion and the pitch-angle and energy scatterings during energy slowing down process are considered in the simulation. The figures below show contour plots of beam pressure of co-NBI in LHD at one poloidal cross-section with and without magnetic perturbation of $(m, n) = (2, 1)$ mode. We observed formation of localized beam pressure distribution in presence of magnetic islands. In the presentation, we will discuss the effect of RMP producing magnetic islands on confinement and velocity space distribution of NBI beam ions in LHD plasmas.



without perturbation



with $(m, n) = (2, 1)$ perturbation

[1] Y. Narushima *et al.*, Nucl. Fusion **55** (2015) 073004
[2] H. Yamaguchi *et al.*, Plasma Fusion Res. **8** (2013) 2403099
[3] S. Murakami *et al.*, Nucl. Fusion **46** (2006) S425