



Effects of non-axisymmetric magnetic field on neoclassical transport and ambipolar electric field in tokamak plasmas

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Abstract

Resonant magnetic perturbations (RMPs) coils have been installed on many tokamaks for control of edge localized modes (ELMs), but induce the non-axisymmetric magnetic field. The non-axisymmetric magnetic field can influence the neoclassical transport and change the radial electric field by ambipolar condition. We find that RMPs can significantly enhance the neoclassical transport on resonance surface by generating magnetic islands [1] for high temperature plasmas, which can partially explain the decrease of temperature on the resonance surface in DIII-D [2]. The ambipolar radial electric field from neoclassical theory will be reduced by RMPs in DIII-D pedestal, the reduction will be strengthened by increasing the amplitude of RMPs, especially when ELMs are suppressed by RMP. The reduction of radial electric field qualitatively agrees with the experimental observations on DIII-D [3].

Keywords: non-axisymmetric magnetic field, neoclassical transport, ambipolar electric field

References

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