

Effects of Resistivity and Pellet Injection on Edge Localized Modes

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Abstract

High confinement mode or H-mode for fusion plasma in tokamak is an important phenomenon, and it is necessary because many basis quantities are raised up, such as plasma density, pressure, and temperature. These are useful to fusion reaction because both the chance of reaction and temperature are increased, which allows higher fusion power. But plasmas with high pressure and temperature are often difficult to maintain their stability. A periodic release of high energy from plasmas, called edge localized modes, are losses from plasma edge to first wall of tokamak. It can transport plasma particles and energy to damage the first wall. In this work, a simulation code called BOUT++ is used to investigate ELMs mechanism. The effect of resistivity and pellet injection on ELMs are investigated based on the peeling-ballooning three-field MHD module of BOUT++ with taking into account non-ideal physics effects including diamagnetic drift, $E \times B$ drift, resistivity, and anomalous electron viscosity. It is found that the ELMs size increase with increasing resistivity via decreasing of Lundquist number. The Lundquist number is inversely proportional to the resistivity, which is varied from 1×10^7 to 1×10^8 and anomalous electron viscosity is 1×10^{-4} . In addition, the pressure profile modified by pellet injection from low field side of tokamak can trigger ELMs by changing pressure profile into various shapes. The deposition position of pellet injection affects the behavior of ELMs differently. Therefore, ELMs behavior is studied via two main deposition position of pellet atom including pedestal top and steep pedestal region. And both effect of resistivity and pressure profile modified on ELMs are investigated together.

Key word: Resistivity, Pellet injection, Edge localized mode.