Contribution ID: **135** Type: **Poster**

Nonlinear gyrokinetic analysis of linear Ohmic confinement to saturated Ohmic confinement transition

Thursday 25 October 2018 14:00 (20 minutes)

One of the long lived conundrums in ohmically heated plasmas is that the energy confinement time τ_E shows a transition from a linear regime proportional to the density (LOC) to a saturation regime (SOC) weakly dependent on the density. In the viewpoint of the first principle nonlinear global gyrokinetic simulations, we here present an investigation of LOC to SOC transition for the first time. In this study, by varying a single parameter plasma density, the confinement time estimated by τ∝1/χ_eff shows a transition from a linearly increasing regime to a saturation regime as the plasma density increases. The effective transport diffusivity is defined as χ_eff≡(n_e χ_e ∇T_e+n_i χ_i ∇T_i)/(n_e ∇T_e+n_i ∇T_i), where n_(e(i)),T_(e(i)) and χ_(e(i)) are density, temperature and heat diffusivity for electron (e) and ion (i). The above nonlinear result follows the trend from the mixing length quasilinear estimation for the heat transport. A transition of trapped electron dominant heat transport from TEM to ion dominant heat transport from ITG is observed when the LOC to SOC transition occurs. In the simulations, the Coulomb collision operator for ion-ion collision and the pitch-angle scattering operator for electron-ion collision are included. The physical effects of the collisions in the LOC to SOC transition can be understood by analyzing the phase space dynamics. Physics of intrinsic rotation reversal [1,2] and E×B staircase [3], both of which were found to have close relations with LOC-SOC transition, will be discussed.

[1] J. E. Rice, et al., PRL 107, 265001 (2011)
[2] Y. J. Shi, et al., Nucl. Fusion 57, 066040 (2017)
[3] G. Hornung, et al., Nucl. Fusion 57, 014006 (2017)

Country or International Organization

Korea, Republic of

Paper Number

TH/P6-10

Author: Dr QI, Lei (National Fusion Research Institute of South Korea)

Co-authors: Dr KWON, Jae-Min (National Fusion Research Institute, South Korea); Dr YI, Sumin (National Fusion Research Institute); Prof. HAHM, Taik Soo (Seoul National University)

Presenter: Dr QI, Lei (National Fusion Research Institute of South Korea)

Session Classification: P6 Posters