

Fast-ion Transport Induced by Edge Localized Modes

Tuesday, 7 December 2021 16:40 (20 minutes)

Edge localized modes (ELMs) are inherent to a transport barrier at the tokamak plasma edge. While there have been extensive theoretical as well as simulation studies on the ELM characteristics, there are relatively few studies on the effects of ELMs on fast-ion transport [1]. Here, by employing the nonlinear gyrokinetic theory, we develop a theoretical analysis of the fast-ion transport induced by ELMs, including the effects such as finite Larmor radius, finite drift orbit width, realistic magnetic field geometry, and magnetically trapping of particles. The derived transport equation allows a detailed discussion for the relative importance of various contributions. In particular, it demonstrates the transport scaling of fast-ions by ELMs, and further clarifies the energy and pitch angle dependence of the radial diffusivity. The findings provide a plausible explanation for the experimental observations [1, 2, 3].

Work supported by the European Research Council (ERC) under the European Unions Horizon 2020 research and innovation programme (grant agreement No. 805162).

References

- [1] M. Garcia-Munoz, et al., Plasma Phys. Control. Fusion, 55, 124014 (2013)
- [2] J. Galdon-Quiroga, et al., Phys. Rev. Lett, 121, 025002 (2018)
- [3] J. Galdon-Quiroga, et al., Nucl. Fusion, 59, 066016 (2019)

Speaker's Affiliation

University of Seville, Seville

Member State or IGO

Spain

Primary author: Dr CHEN, Haotian (University of Seville)

Co-authors: Dr RIVERO-RODRIGUEZ, J. Francisco (University of Seville); Dr DOMINGUEZ-PALACIOS, J. (University of Seville); Prof. CHEN, L. (Zhejiang University); Dr ZONCA, F. (5Center for Nonlinear Plasma Science and C.R. ENEA Frascati); Dr GALDON, J. (University of Seville); Dr DOYLE, S. J. (University of Seville); Prof. VIEZZER, E. (University of Seville); Prof. GARCIA-MUNOZ, M. (University of Seville)

Presenter: Dr CHEN, Haotian (University of Seville)

Session Classification: Transport of Energetic Particles

Track Classification: Transport of Energetic Particles