

## Effects of the non-perturbative mode structure on energetic particle transport

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Energetic particle (EP) transport in the presence of Alfvénic mode determines the EP profiles and plays a crucial role in confinement. In order to model the EP transport efficiently, mixed linear-nonlinear recipes are used in various codes [1,2,3], in which the mode structure is from linear simulation and is used in the EP transport calculation. For “perturbative” approach, the linear mode structure is calculated without taking into account the EP effects [4]. In this work, the effects of non-perturbative mode structure are studied by considering EP’s effects on the mode structure and in turn, the effects on EP transport. In particular, the mode structure with symmetry breaking properties in terms of net radial propagation or parallel propagation is adopted [5]. The radial mode structure  $A(r) = \exp[-\sigma(r - r_0)]$  with complex parameters  $\sigma$  and  $r_0$  is used and their values are fitted from the gyrokinetic eigenvalue code LIGKA [6]. The impact on EP transport has been studied using the LIGKA-HAGIS coupling scheme [3,6,7]. The resonant broadening due to the perturbative mode structure is analyzed along with the previous work [8]. The effect of mode structure symmetry breaking on the EP distribution function relaxation and the mode saturation level is also studied.

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### Country or International Organization

Germany

**Primary author:** MENG, Guo (Max Planck Institute for Plasma Physics)

**Co-authors:** LAUBER, Philipp (IPP Garching); LU, Zhixin (Max Planck Institute for Plasma Physics); WANG, Xin (Max Planck Institute for Plasma Physics); HAYWARD-SCHNEIDER, Thomas (Max Planck Institute for Plasma Physics)

**Presenter:** MENG, Guo (Max Planck Institute for Plasma Physics)

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