Effect of thermoelectric currents on the magnetic topology in DIII-D

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Abstract

In the model discussed here a two-step approach is used to describe the dynamics of edge localized modes (ELMs), considering a typical ELMing H-mode lower single null discharge as reference state. In the first step large flux tubes are formed and a connection to the upper targets is established. The process of the flux tube formation is discussed. In the second step, large currents as found in measurements in DIII-D, are assumed running through the newly formed large flux tubes. Two different realizations of the current distribution within the tubes are compared, namely a single filament in each tube and a scenario where the current in each tube is split into ten sub-filaments. The latter is shown to be the more realistic distribution and leads to even better agreement with infrared camera observations where it is shown that stripe patterns in the divertor heat flux produced by ELM in the DIII-D tokamak can be reproduced numerically by taking into account the magnetic perturbation of thermoelectric current filaments. These stripe patterns run through short connection length flux tubes which perforate the plasma edge region. Such flux tubes are formed, e.g., by error fields and other non-axisymmetric perturbations.

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