

**Title:** Anomalous diffusion of plasma in tokamak edge region

**Author:** Jakub Seidl

**Tutoring institution:** Institute of Plasma Physics AS CR, v.v.i.

**Supervisor:** Doc. Ing. Ladislav Krlín, DrSc., IPP AS CR

**Consultant:** RNDr. Radomír Pánek, Ph.D., IPP AS CR

**Abstract:** This work provides brief introduction to the topic of plasma turbulence in tokamak edge region and several aspects of anomalous plasma diffusion are discussed. We use numerical code ESEL to model interchange turbulence and investigate properties of turbulent structures in different regimes of parallel transport. Means of experimental verification of the results are discussed. Results of the modelling are then used to interpret unexpected results experimentally obtained by electrostatic ball-pen probes on tokamak ASDEX Upgrade, mainly appearance of a 'bump' in power spectra of measured plasma potential. Next, we explain behaviour of cross-correlation function of density signals measured by two spatially separated Langmuir probes in the vicinity of magnetic separatrix and we point out an ambiguity in interpretation of results of vorticity measurement made by set of floating Langmuir probes. In the last part, transport of plasma impurities by electrostatic turbulent potential is modelled. We identify reversal of radial particle velocity for particles with higher mass-to-charge ratio and explain it as a result of unstable particle trajectories on positive potential structures. The transport of particles with fully resolved cyclotron orbits is compared with drift approximation.

**Keywords:** Tokamak, plasma turbulence, anomalous diffusion, electrostatic probes, interchange instability