

The doctoral thesis presents the diagnostic neutral lithium beam on the COMPASS tokamak in Prague. The technical part describes the system for injection of accelerated lithium beam into the COMPASS tokamak and the respective detection systems for beam emission spectroscopy. The physical part describes the analysis of measured spectroscopic data, with particular emphasis on density fluctuations in the edge plasma. Detailed analysis of turbulent structures outside of the confined plasma region is presented, as well as investigations of the ELM instabilities during high confinement mode plasma operation. The thesis also presents the development and proof-of-concept measurements of a new and unique diagnostic method - atomic beam probe. The method uses detection of the ionized part of the beam for current density profile measurements in the plasma edge.