Plenarvortrag PV II Mo 10:00 Plenarsaal

The dual role of the plasma edge in tokamaks — •Elisabeth Wolfrum — Max Planck Institute for Plasma Physics, Garching, Germany

One of the paths to achieving nuclear fusion on earth is the confinement of hot plasma in a magnetic device, called tokamak. In the largest one, ITER, currently being built in the south of France, a burning deuterium-tritium plasma will require core ion temperatures above 10 keV (100 Mio °C) at densities around $10^{20} m^{-3}$. In the core of a tokamak plasma turbulence is the dominant transport mechanism limiting the temperature gradient. Therefore, the first role of the plasma edge is to act as boundary condition to the core, as its temperature value is a crucial quantity which determines the performance of a tokamak plasma. In steady state conditions, all heat, that is deposited or produced in the centre, is transported across the plasma edge towards the wall. Thus, the second role of the plasma edge is to provide conditions for safe operation without damaging the plasma facing components.

The plasma edge region is characterised by different physical properties, such as strong pressure gradients which drive flow shear. This combination can lead to both suppression of background turbulence as well as drive of magneto-hydrodynamic and turbulent modes determining the transport from the core to the wall. In this talk the most important ingredients of the physical properties of the plasma edge will be explained, the status of knowledge will be shown together with possible options for the operation of the plasma edge in ITER, and open research questions will be illustrated.