Recent developments of Integrated Data Analysis at ASDEX Upgrade:

**Kinetic profiles, current diffusion and equilibrium**


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In nuclear fusion research the coherent combination of measured data from heterogeneous diagnostics with modelling codes providing physical restrictions on the parameter space allows for an improved treatment of ill-posed inversion problems such as the equilibrium reconstruction. Different techniques for measuring the same subset of physical parameters provide complementary and redundant data for, e.g., improving the reliability of physical parameters, increasing the spatial and temporal resolution of profiles, and resolving data inconsistencies. The combination of the measurements forward models with physical modelling to reduce reasonably the parameter space beneficially helps to reduce the ambiguity of the parameters to be estimated without employing non-physical constraints.

Integrated Data Analysis (IDA) at ASDEX Upgrade routinely combines measurements of lithium beam emission (LIB), interferometry, electron cyclotron emission (ECE), and Thomson scattering, for a joint estimation of electron density and temperature profiles. The close correlation of the profile analysis with the magnetic equilibrium requires the integration of profile and equilibrium analyses. As the kinetic profiles provide valuable information to restrict the equilibrium pressure profile, a poloidal flux diffusion modelling code provides constraints on the poloidal profile of the flux surface averaged toroidal current density. The combination of measured and modelled data allows to overcome the persisting problem of missing regular and reliable magnetic measurements in the plasma core for the reconstruction of full current profiles.

The recent progress in profile reconstruction due to improvements in the diagnostics LIB, ECE and interferometry and the progress in the equilibrium reconstruction combining kinetic profiles with current diffusion modelling will be shown.