



PHD Project

Title:

Experimental investigation of Neoclassical Viscous Torque in ASDEX Upgrade

Where:

This PhD position is based at the Max Planck Institute for Plasma Physics (IPP) in Garching, near Munich, Germany. The IPP, a research institute of the Max Planck Society, is the largest center for fusion research in Europe, employing approximately 1,100 people across its Garching and Greifswald sites. Scientists at IPP investigate the physical principles underlying fusion power plants, aiming to generate energy from the fusion of light atomic nuclei—similar to the process that powers the sun.

Project Description:

The ASDEX Upgrade facility, a medium-sized tokamak located in Garching, is used to study plasma physics relevant to future fusion devices, such as ITER. A tokamak's toroidal symmetry can be imperfect due to design variations or external influences like magnetic perturbations. These deviations affect heat, particle, and particularly momentum transport within the plasma, a phenomenon often described by Neoclassical Toroidal Viscous Torque (NTV) [N. Logan, *Nuclear Fusion* 2016].

Substantial experimental work at ASDEX Upgrade has focused on quantifying the NTV effects caused by 3D magnetic perturbations. This PhD project will begin by evaluating data from previous experiments. The next phase will involve designing new experiments at ASDEX Upgrade, using advanced analysis tools such as those by B. Zimmermann [B. Zimmermann, *Nuclear Fusion* 2023], to validate NTV models in collaboration with TU Graz. The main tasks will include data analysis, data modelling (using Python), experiment design, and diagnostic operation.

Your profile:

Master's degree in Physics with above-average grades. Interest in programming, data analysis, and hands-on experimental work.

Who to Contact:

Dr. Matthias Willensdorfer, matthias.willensdorfer@ipp.mpg.de