ulm university universität ulm

Fakultät für Naturwissenschaften, Fachbereich Physik

Hauptseminar Plasma Physics: Diagnostics for plasma physics and application to nuclear fusion research

Start: 23.04.2020

Description

Today's nuclear fusion experiments are used to identify the best possible candidate plasma scenarios which are compatible with next-step fusion devices such as ITER or DEMO. In this sense, it is important to obtain plasmas with good energy confinement, and their compatibility with the first wall and divertor solutions has to be checked. In order to reliably determine plasma parameters experimentally, plasma diagnostics are used which permit the determination of a variety of important quantities with high precision.

This course addresses several key parameters for nuclear fusion experiments, and lays out their importance both for plasma performance and plasma-material interaction compatibility. Measurement methods used in order to obtain the above parameters will be presented conceptually, and examples from the real nuclear fusion world will be presented.

Learning Outcomes

Understanding of key physics topics of today's nuclear fusion science. Understanding on how to diagnose important quantities of a fusion plasma along with their interpretation, in regard of ITER.

Content

Each seminar will consist of a pair of two related presentations (not compulsory). One of them introduces the key physics topic or quantity, while the other covers a more applied view on how to diagnose, analyze and interpret the topic under consideration. In the first meeting, the topics will be presented and assigned and the criteria for evaluation will be explained.

Topics:

- Heat transport onto divertor targets / Langmuir Probe Measurements
- Plasma current profile in tokamaks / Motional Stark Effect
- Turbulence in fusion plasmas / Reflectometry
- The edge pedestal of fusion plasmas / Thomson Scattering & ECE
- Radiation in fusion plasmas / Bolometry
- Power exhaust (ex. ITER) / Infrared Thermography
- Impurities, Helium transport / Charge Exchange Recombination Spectroscopy

Prerequisites

Experimental physics and electrodynamics advantageous, Plasma I not necessary but beneficial.

Literature

Will be discussed on first meeting and provided to the seminar presenters.

Additional Information

The seminar is suited to be combined with 'Plasma Physics: Applications' held by T. Happel.

Dates

Pre-Meeting on Thursday, 23.04.2020, 12:15 – 13:45. Talks in 'Blockveranstaltung', date t.b.d.

Lecturer

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