SYPZ 2 SYPZ II

Zeit: Dienstag 14:00–16:00 Raum: HU 3038

Hauptvortrag SYPZ 2.1 Di 14:00 HU 3038

Key R&D issues in the field of ITER Diagnostics — •A.J.H. Donne — FOM-Institute for Plasma Physics Rijnhuizen, PO Box 1207, 3430 BE Nieuwegein, The Netherlands

The development of diagnostics for the ITER tokamak is a major challenge. Within the International Tokamak Physics Activity (ITPA), one Topical Group (TG) specialises in diagnostics and aims to support the development of the needed systems. The work of the group includes the identification and development of the requirements for measurements, advising on the selection and design of techniques and on their implementation on ITER, and development of appropriate databases. Several tasks have been identified as 'high priority' and form the focus of current work: (i) Review of the requirements for measurements of the neutron/ α-particle source profile and assessment of possible methods of measurement (ii) Development of methods of measuring the energy and density distribution of confined and escaping α-particles (iii) Study of the environmental effects on the life-time of first mirrors used in various ITER diagnostics (iv) Assess impact of Radiation Induced Electro-Motive Force (RIEMF) and Radiation Induced Thermo-Electric Sensitivity (RITES) on magnetic measurements and develop methods for the measurement of steady state magnetic fields under ITER conditions (v) Development of diagnostics for the in-situ measurement of dust and study of possible mitigation measures In the presentation a brief overview of the field of ITER diagnostics will be given, with the specific emphasis on a number of the issues listed above.

Hauptvortrag SYPZ 2.2 Di 14:30 HU 3038

Anomalous transport in tokamak plasmas — •Arthur G. Peeters — Max Planck Intitut fuer plasma physics, Boltzmannstr. 2 85748 Garching

In a fusion reactor energy and particles must be confined for a sufficient long time in order for a sufficient amount of fusion reactions to occur. Transport fluxes, however, do not follow the classical predictions based on particle orbits and Coulomb collisions. It is refered to as anomalous, and is thought to be the consequence of micro-instabilities leading to a turbulent state. The study of anomalous transport recieves much attention because it is a key issue for a reactor, but also because it is a chalanging physics problem. Turbulence in a tokamak has several unique features compared to other physical systems due to the existence of a strong magnetic field in combination with a (nearly) collisionless plasma.

In this talk the basic features of the micro-instabilities are discussed. Driving and damping terms as well as the role of basic physics ingredients, such as collisions, are introduced. The non-linear state and saturation mechanisms are then reviewed. After this discussion on theory a critical comparison with the experimental observations is presented. The latter will show that significant progress has been made in the last decade.

Hauptvortrag SYPZ 2.3 Di 15:00 HU 3038

Active Control of MHD Instabilities in Fusion Plasmas — •Hartmut Zohm — Max-Planck-Institut für Plasmaphysik, Boltzmannstr. 2, 85748 Garching

Global MHD instabilities limit the operational space of magnetically confined fusion plasmas. The driving free energy is associated with the gradient of the kinetic plasma pressure and, in devices which rely on strong internal currents to generate the confining field, the gradient of the current density. With the availability of localised heating and current drive in the Electron Cyclotron frequeny range, it has recently become possible to improve the stability of tokamak plasmas against MHD instabilities with relatively modest power requirements. The talk reviews experimental results obtained on a number of tokamak experiments worldwide. It is also shown that significant progress has been made in understanding these phenomena.

Hauptvortrag SYPZ 2.4 Di 15:30 HU 3038

Plasma-Wand-Wechselwirkung — •Ulrich Samm — Institut für Plasmaphysik, Forschungszentrum Jülich GmbH, 52425 Jülich

Zum ersten mal in der Menschheitsgeschichte ist der komplette Entwurf einer Maschine gelungen, die nach dem Prinzip der kontrollierten Kernfusion unter quasi-stationären Bedingungen einen signifikanten Überschuss an Energie liefern wird: Der *International Tokamak Experimental Reactor (ITER)* soll bei einer thermischen Leistung von 500 MW 10mal mehr Energie liefern, als zur Erzeugung des erforderlichen Hochtemperaturplasmas erforderlich ist. Damit wird der Beweis der grundsätzlichen physikalischen Machbarkeit der kontrollierten Kernfusion geführt.
Während die Plasmen in den experimentellen Anlagen zeitlich begrenzt erzeugt werden (z.B. Pulsdauer in ITER etwa 8 Minuten), muss ein Kraftwerk für Monate kontinuierlich laufen. Die Realisierung eines solchen Dauerbetriebes stellt eine der verbleibenden großen Herausforderungen der Fusionsforschung dar.
Dabei ist die Plasma-Wand-Wechselwirkung ein Schlüsselthema. Die multidisziplinäre Optimierungsaufgabe betrifft sowohl die Gestaltung der Plasmaparameter im Randbereich als auch die Frage der einzusetzenden Wandmaterialien. Dieses Zusammenspiel bestimmt die Lebensdauer von Wandkomponenten und hat auch Auswirkungen auf die Verfügbarkeit der gesamten Anlage, z.B. wegen eines evtl. zu starken Einfangs von Tritium in den Wänden. Der Beitrag wird das Forschungsprogramm in diesem Bereich darlegen und mögliche Lösungen der Probleme diskutieren.