P 14: Magnetischer Einschluss

Zeit: Mittwoch 14:35–16:05 Raum: 6B

P 14.1 Mi 14:35 6B

Status of Equilibrium Reconstruction with EFIT at TEXTOR including 3D effects — •Christopher Wiegmann[1], Oliver Zimmermann[1], Detlev Reiter[1], and Wolfgang Zwingmann[2] — [1]Institut für Plasmaphysik, Forschungszentrum Jülich GmbH, EURATOM-Association, Trilateral Euregio Cluster, 52425 Jülich, Germany — [2]Association EURATOM-CEA/DSM/DRFC Cadarache, 13108 St-Paul-Lez-Durance, France

The equilibrium reconstruction code EFIT [1] has been installed at the iron core tokamak TEXTOR and its applicability to TEXTOR conditions and configurations is analyzed. EFIT uses an interleaved Picard and fitting iteration scheme to solve the Grad-Shafranov equation with experimental data as constraints. Magnetic diagnostics are used as basic input. The problem of equilibrium reconstruction is ill-posed, especially from external magnetic data only. To resolve this additional input from internal MSE and kinetic measurements is needed. It is found that the available magnetic diagnostics at TEXTOR are insufficient in number and distribution to obtain key plasma parameters such as e.g. β_{pol} to an acceptable accuracy. Hence, an extension of the diagnostic system is proposed on the basis of EFIT tests. A 3D correction for the magnetic field ripple of the toroidal field coils based on earlier work [2] has now been made available for TEXTOR. Further steps to incorporate 3D perturbations of the dynamic ergodic divertor on the equilibrium are undertaken and first results are given.

[1] Zwingmann, W. NF 43 (2003) pp. 842 [2] Zwingmann, W. AIP Conf.Proc. 871 (2006) pp. 430

P 14.2 Mi 14:50 6B

A model for transport of heat through magnetic islands — •Abhinav Gupta, Xavier Loozen, Mikhail Tokar, and Robert Wolf — Institut fuer Energieforschung, Forschungszentrum Juelich GmbH, EURATOM Association, Trilateral Euregio Cluster, 52425 Juelich, Germany

On application of small resonant magnetic field perturbations non-overlapped magnetic island chains can be formed, where transport is enhanced due to radial component of transport along field lines. Such a modification of the heat transport is relevant for ELMs suppression and, moreover, can be helpful to get information about transport along field lines being of importance in stochastic plasmas and during ELMs. In the present work a model for transport of heat through magnetic islands has been developed. Contrary to previous approaches, by considering the continuity of heat flux we avoid assumptions on the temperature profile in the island based on the profile shape without island. Transport along different paths with sections parallel and perpendicular to the field lines is considered. The effective heat conduction through the island is determined as that along optimal paths with the smallest temperature difference. The model predicts that heat is mainly transported near the island separatrix and provides the variation of the effective heat conductivity with field perturbation level.

P 14.3 Mi 15:05 6B

MHD induced fast ion losses in ASDEX Upgrade — •Manuel Garcia-Munoz[1], Hans Ulrich Fahrbach[1], Hartmut Zohm[1], Josef Neuhauser[1], Marc Maraschek[1], Sibylle Günter[1], Piero Martin[2], Karl Sassenberg[1], and Valentin Igochine[1] — [1]Max Planck Institut für Plasmaphysik, EURATOM Association, D-85748 Garching, Germany — [2]Consorzio RFX, Associazione EURATOM-ENEA per la fusione, Padova, Italy

We present the first results obtained with the new Fast Ion Loss Detector (FILD) installed recently in ASDEX Upgrade. An overview of the measurements and their preliminary conclusions is presented. FILD provides energy and pitch-angle (arcos(Vpar/V)) resolved FIL measurements with a bandwidth of 1 MHz, which comfortably covers all the dynamics up to Alfvén modes. The energy range covers from 60 keV up to 700 keV for deuterium ions at a central magnetic field of 2T while the pitch-angle ranges from 20° up to 87°. Lost particles have been observed in the presence of a rich variety of MHD phenomena, from low frequency MHD modes like NTMs to high frequency modes i.e. TAEs. A strong correlation between mode amplitude and amount of particle losses is observed. The loss mechanisms involved in the ejection of fast ions due to ELMs, NTMs and TAEs are discussed. In addition, a new MHD mode has been identified for the first time by means of its strong and deleterious influence on the energetic ion population.

P 14.4 Mi 15:20 6B

The Role of Magneto-Hydrodynamic Instabilities in the Improved H-Mode Scenario — •Asher Flaws, Anja Gude, Valentin Igochine, Costanza Maggi, Marc Maraschek, and Hartmut Zohm — Max-Planck-Institut fuer Plasma Physik, Garching, Euratom Association, Germany

A database of magneto-hydrodynamic (MHD) instabilities in the improved H-mode scenario on ASDEX Upgrade has been compiled. The database comprises of MHD parameter time series for some 75 improved H-mode shots. Poloidal/toroidal wave-numbers; mode amplitude, and frequency progression have been tracked for the Neo-classical Tearing Mode (NTM), Frequently Interrupted Regime NTM (FIR-NTM), Fishbone, and Sawtooth instabilities. Additionally, a study of selected time slices provides a statistical overview of the presence/absence of each MHD type versus various plasma parameters, such as heating power, confinement, core temperature, etc. The goal of this database is to provide insight into the role of MHD in improving/degrading confinement, establishing the q-profile, and to find the range of plasma parameters in which these MHD exist, along with their onset/termination conditions.

P 14.5 Mi 15:35 6B

Verteilung der Zuflussdichte von Neutralteilchen in ASDEX Upgrade — •Jens Harhausen, Christoph Fuchs, Arne Kallenbach, Marco Wischmeier und ASDEX Upgrade Team — Max-Planck-Institut für Plasmaphysik, Garching, Deutschland

Die Elektronendichte eines Tokamakplasmas wird wesentlich durch den wenige cm schmalen Randbereich mit grossem Dichtegradient bestimmt, der sich im Übergangsbereich von geschlossenen zu offenen magnetischen Flussflächen befindet. Die Profilform wird durch Plasmadiffusion, -konvektion und -quellstärke bestimmt. Der Zufluss von Neutralteilchen als Plasmaquelle lässt sich spektroskopisch aus der Messung der Balmer-α Linie des Wasserstoffs (H_α) bestimmen. Entsprechend der Ausdehnung des Randplasmas und der geringen Eindringtiefe der Neutralen ist eine hohe räumliche Auflösung erforderlich.

In diesem Beitrag wird die experimentelle Herangehensweise mittels Videodiagnostik dargestellt. Zur Auswertung der Videodaten wird unter anderem ein Tomographie-Algorithmus, welcher auch diffuse Reflektion an metallischen Oberflächen berücksichtigt, verwendet. Zum Verständnis der Physik der Neutralen im Plasmarandbereich wird ein Monte-Carlo-Code angewandt, um die experimentell bestimmten Emissivitätsprofile in Zusammenhang mit dem Plasmahintergrund nachzuvollziehen. Dieser Ansatz bietet darüber hinaus die Möglichkeit, in Raumbereichen, in denen keine Plasmaparameter bestimmt werden können, diese über die gemessene H_α-Emissivität abzuschätzen. Ziel ist es, robuste Randbedingungen für komplexe numerische Plasmamodellierung zu liefern.

P 14.6 Mi 15:50 6B

Disruption mitigation studies at TEXTOR — •Sergey Bozhenkov, Michael Lehnen, and Robert Wolf — Institut fuer Plasmaphysik, Forschungszentrum Juelich GmbH, EURATOM Association, Trilateral Euregio Cluster, 52425 Juelich, Germany

The operation of tokamaks is prone to fast accidental losses of the stored energy. These losses referred to as disruptions can cause a severe damage to the machine. The problem becomes especially tough in the future experiment ITER. A massive gas puff is helpful in protecting the machine during a disruption. An impurity decreases the heat flux density by reradiating the energy over a larger surface area. The high particle density provides the collision frequency high enough to hinder acceleration of runaway electrons. The resulting high plasma resistivity reduces the halo currents and consequently forces on the machine.

The work reports on results of the disruption mitigation experiments conducted at TEXTOR. The injections were performed at a predefined time moment into a stable plasma. The addressed gas mixtures are: He, Ar, D_2 + Ar (5%, 10%, 20%). A mixture of Ar and D_2 constitutes a compromise between cooling capability and particle influx rate. The mixtures were also found to better suppress RE production. To give an insight into the dynamics of the process the ultra-fast framing camera was used. The neutral gas jet is not observed to penetrate to the center of the discharge. The discussion of typical timescales of the process is given. The scan of the gas pressure allows the qualitative tendencies in the penetration depth to be revealed. A detailed comparative analysis of the mitigating efficiency of different gases is also presented.