P 17: Poster: Magnetischer Einschluss

Zeit: Donnerstag 14:00–16:00 Raum: Poster EG

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Modelling of helical current filaments induced by LHW on EAST — •Michael Rack[1], Long Zeng[1,2], Peter Denner[1], Yunfeng Liang[1], Xianzu Gong[2], Kaifu Gan[2], Eric Gauthier[3], Liang Wang[2], Fukun Liu[2], Jinping Qian[2], Biao Shen[2], Jiangang Li[2], and the EAST Team[2] — [1]Institute of Energy and Climate Research - Plasma Physics, Forschungszentrum Jülich GmbH, Association EURATOM-FZJ, Partner in the Trilateral Euregio Cluster, D-52425 Jülich, Germany — [2]Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 230031, China — [3]Association EURATOM-CEA, IRFM, F-13108 Saint-Paul-lez-Durance, France

Helical radiation belts have been observed in the scrape-off layer (SOL) of the plasma during the application of lower hybrid wave (LHW) heating at the superconducting tokamak EAST. Modelled SOL field lines, starting in-front of the LHW antennas, show agreement in position and pitch angle to the experimental observed radiation belts. A splitting of the strike-line can be observed on the outer divertor plates during the application of LHW heating. Agreement in the comparison of the Mirnov coil signals and a modelled electric current flow along these SOL field lines was found. A lower hybrid current drive can induce such an electric current flow near the plasma edge. This electric current flow causes a change of the plasma topology which could result in the splitting of the strike-line as known from the application of resonant magnetic perturbation fields. Comparisons of modelled footprint structures and experimental observed heat load patterns in the divertor region are discussed.

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Electron Bernstein wave heating at the stellarator TJ-K — •Alf Köhn, Udo Höfel, Eberhard Holzhauer, Fabian Olbrich, Stefan Wolf, and Mirko Ramisch — Institut für Plasmaforschung, Universität Stuttgart

If the plasma density exceeds the cutoff density of the injected microwaves it becomes inaccessible to them and the waves are reflected. Conventional O- or X-mode heating at the electron cyclotron resonance frequency (ECRF) can no longer take place. Electron Bernstein waves (EBWs) can be used to overcome this limitation: no high-density cutoff exists for these waves and they are very well absorbed at the ECRF and its harmonics. Since this applies to high- and low-temperature plasmas, there exists a wide range of possible applications for them. Due to their electrostatic nature, however, they need to be coupled to injected electromagnetic waves.

In the stellarator TJ-K, overdense plasmas are routinely created by microwave heating at 8 GHz. Appropriate shaping of the injected microwave beam allows to efficiently excite EBWs provided that the fundamental ECRF is located inside the confinement region. As soon as the EBW heating sets in, a sudden increase in the plasma density is observed illustrating the efficiency of this heating mechanism. During a discharge, the background magnetic field can be ramped down by almost a factor of 5 and EBW heating at high harmonics of the ECRF can be investigated. With decreasing magnetic field a reduction in the turbulence level of the plasma density is observed.

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Untersuchungen zum Energietransfer in Driftwellen-Turbulenz am Stellarator TJ-K — •Bernhard Schmid[1], Gregor Birkenmeier[2], Peter Manz[2], Mirko Ramisch[1] und Ulrich Stroth[2] — [1]Institut für Plasmaforschung, Universität Stuttgart — [2]Max-Planck-Institut für Plasmaphysik, EURATOM Assoziation, Garching

Das Verständnis von Zonalströmungen in toroidal eingeschlossenen Plasmen ist für die Fusionsforschung von großer Bedeutung, da diese mit dem Übergang in die H-mode in Zusammenhang gebracht werden. Die zentrale Aufgabe ist es dabei detaillierte Untersuchungen zum Energietransfer anzustellen. Die Niedertemperaturplasmen am Stellarator TJ-K bieten die Möglichkeit Potential und Dichte mit hoher Orts- und Zeitauflösung mit Langmuir-Sonden im gesamten Plasmavolumen zu messen. Somit können die einzelnen Energiebeiträge aufgeschlüsselt werden. Zonalströmungen bilden dabei ein komplexes System mit der umgebenden Turbulenz. Die Energie in den Driftwellen stellt den Antrieb für die Zonalströmungen dar. Auf der anderen Seite ist die Resistivität über die Kopplung in die Druckseitenbänder die globale Energiesenke. In dieser Arbeit wird in einem ersten Schritt die Energieverteilung in der Turbulenz untersucht. Die Skalierung von Lebensdauer und Auftrittshäufigkeit der Zonalströmungen mit der Adiabatizität soll dabei Aufschluss über den Einfluss der Dämpfung geben. Da die Zonalströmung durch Verscherung wieder auf die Turbulenz zurückwirkt, werden außerdem die Auswirkungen der Zonalströmung auf die Korrelationslänge betrachtet.

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Mitigation of disruptions by massive gas injection at TEXTOR — •Andrey Lvovskiy[1], Hans R. Koslowski[1], Michael Lehnen[1], and Long Zeng[1,2] — [1]Institute of Energy and Climate Research - Plasma Physics, Forschungszentrum Jülich GmbH, Association EURATOM-FZJ, Trilateral Euregio Cluster, D-52425 Jülich, Germany — [2]Institute of Plasma Physics, Chinese Academy of Sciences, 230031 Hefei, China

Disruptions are serious issue for safe and reliable operation of tokamak-based fusion machine. Consequences of disruptions such as electromagnetic loads, thermal loads and runaway electrons could cause damage of plasma facing components and even vacuum vessel of future large tokamak ITER. Avoidance or at least mitigation of disruptions is strongly necessary for ITER operation.

Massive gas injection (MGI) could be an efficient way of disruption mitigation. Noble gas MGI mitigates thermal and electromagnetic loads as well as runaway generation.

In this work presented experiments on disruption mitigation at TEXTOR with injection of Ar, He and Ne in wide gas pressure range.

Major diagnostics in the described experiments was a dispersion interferometer (DI). CO2-laser based DI uses separation of reference and sample beams in the frequency space instead of geometric space. Therefore DI is sustainable to influence of vibrations. Advanced modulation technique allows reliable work of DI in wide phase range as well as at rapid and strong change of phase. Because of these advantages DI is a well suitable diagnostics for density control during disruptions.