Contribution ID: **274** Type: **Poster**

Ion Cyclotron Range of Frequency Power Challenges and Solutions

Thursday, 20 October 2016 14:00 (4h 45m)

The coupling of power in the Ion Cyclotron Range of Frequency to the plasma has encountered challenges, which can be classified into two broad ranges of categories: the sensitivity to the plasma edge density profile with the difficulty to couple power to the plasma and the enhanced plasma-antenna interaction with, among others, the resulting impurity production.

We report on the recent results obtained at the Max-Planck-Institut für Plasmaphysik in cooperation with other partners, to address successfully those challenges.

In the category sensitivity to the plasma edge density profile, the problems encountered due to strong ELMs have long been solved with the use of 3-dB couplers. In recent experiments, local gas puffing helped to tailor the density profile and increase the coupling. Since a systematic study confirmed that the coupling can be calculated if the local density profile is known, we expect that the development of a theoretical approach to model the local density profile will develop into a predictive capability to calculate and optimize the coupling also for future machines. We will soon be able to benchmark this modeling with local density measurements, of which first results are available directly at the antenna.

In the category enhanced plasma-antenna interaction, the hypothesis is that the enhanced interaction is due to RF sheaths, and that those sheaths are a consequence of induced current driven at inappropriate locations. New 3-strap antennas in ASDEX Upgrade were designed to reduce those unwanted currents.

This approach leads indeed to a strong reduction of the impurity production.
When the original W-coated 2-strap antennas were energized, the increase with ICRF of the W impurity concentration in the edge plasma is about twice the increase as when the B-coated 2-strap antennas were in operation.
In contrast to this, when the new W-coated 3-strap antennas are energized the W concentration is not higher than when the B-coated 2-strap antennas are in operation. Direct measurements of the impurity production at the limiters of the W-coated antennas show a reduction by a factor of 2 between the 3-strap and the 2-strap antennas.

Theoretical approaches to model in detail the formation of the sheaths are being developed and will be checked against measurements on ASDEX Upgrade and on IShTAR, a dedicated test stand.

Paper Number

EX/P6-26

Country or International Organization

Germany

Primary author: Prof. NOTERDAEME, Jean-Marie (Max-Planck-Institute for Plasma Physics)

Co-authors: Mr ASDEX UPGRADE TEAMS, - (Max-Planck-Institute for Plasma Physics); Prof. MST1 TEAMS, - (EUROFusion); Dr MANCINI, A. (ENEA); Dr MESSIAEN, A. (LPP/ERM-KMS Brussels); Dr SILVA, A. (IST, Lisbon, Portugal); Dr TUCCILLO, Angelo A. (ENEA); Mr AGUIAM, D. (IST, Lisbon, Portugal); Dr MILANESIO, D. (POLITO, Italy); Dr VAN EESTER, Dirk (LPP-ERM/KMS); Dr FAUDOT, E. (Univ. Lorraine); Dr ROCCHI, G. (ENEA); Mr FAUGEL, H. (Max-Planck-Institute for Plasma Physics); Mr FUENFGELDER, H. (Max-Planck--Institute for Plasma Physics); Mrs ZAMMUTO, I. (Max-Planck-Institute for Plasma Physics); Dr STEPANOV, Ivan (LPP/ERM-KMS Brussels); Dr MORITZ, J. (Univ. Lorraine); Dr JACQUOT, Jonathan (Max-Planck-Institute for Plasma Physics); Dr CROMBE, Kristel (Ghent University, Belgium); Dr COLAS, Laurent (CEA, IRFM); Dr D'ARCANGELO, O. (ENEA); Dr TUDISCO, O. (ENEA); Dr WANG, Q. (ASIPP, Hefei, China); Dr YANG, Q. (ASIPP, Hefei, China); Dr D'INCA, R. (Max-Planck-Institute for Plasma Physics); Prof. MAGGIORA, R. (POLITO, Italy); Dr OCHOUKOV, R. (Max-Planck-Institute for Plasma Physics); Mr RAGONA, R. (LPP/ERM-KMS Brussels); Prof. HEURAUX, S. (Univ. Lorraine); Mr VIERLE, T. (Max-Planck-Institute for Plasma Physics); Dr BOBKOV, Volodymyr (Max-Planck-Institute for Plasma Physics); Mr ZHANG, Wei (Max-Planck-Institute for Plasma Physics); Dr CHEN, Y. (ASIPP, Hefei, China)

Presenter: Prof. NOTERDAEME, Jean-Marie (Max-Planck-Institute for Plasma Physics)

Session Classification: Poster 6

Track Classification: EXS - Magnetic Confinement Experiments: Stability