Narodowe Centrum Badań Jądrowych
National Centre for Nuclear Research
ŚWIERK

Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska (UZ3)
Departament Badań Układów Złożonych (DUZ)
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Jędrzej Walkowiak
NCBJ

Numerical analysis of runaway electron generation in tungsten-rich tokamak plasmas

Abstract:

Current plans to build a fusion reactor envision a tokamak-type device with tungsten plasma facing components. The tokamak concept is based on the magnetic confinement of the plasma, in which the magnetic field is generated by the combined contribution of current flowing in the magnetic coils and in the confined plasma. This dependence on the plasma current makes tokamak operation difficult since plasma confinement depends on the plasma parameters. Sudden loss of plasma confinement is called disruption and is an important issue for tokamak safety.

Uncontrolled disruption can cause high thermal and mechanical stresses on plasma facing components. One dangerous phenomenon is the generation of runaway electrons, which can lead to the local melting of plasma facing elements. Mitigation and control of runaway electrons is one of the important tasks in preparation for the operation of future nuclear reactors.

The purpose of my PhD studies was to conduct a numerical experiment of tokamak disruptions with tungsten impurities. The goal was to determine the effect of tungsten on the evolution of the disruption, thermal and current quench times, and the production of runaway electrons. To achieve this goal, theoretical models of elastic and inelastic electron collisions with plasma impurities were developed and implemented in the DREAM code, which was used for numerical simulations.

Serdecznie zapraszamy
Mariusz Dąbrowski, Tomasz Kwiatkowski
http://www.phd4gen.pl

Bio:
Jędrzej Walkowiak jest absolwent Politechniki Poznańskiej, uczestnik studiów doktoranckich w Instytucie Fizyki Jądrowej PAN, obecnie pracuje w Zakładzie Energetyki Jądrowej i Analiz Środowiska (UZ3) NCBJ.