UPPSALA
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Neutron yield scaling laws on MAST

Engineering Programme Degree Project (Ex-jobb) in Neutron Diagnostic for Fusion Plasmas 30 credits (20 weeks)

The Neutron Fusion Diagnostic Group is responsible of the operation of the neutron flux monitor at the Mega Amperical Spherical Tokamak (MAST) at the Culham Science Centre for Fusion Energy in UK. MAST will suspend operations in September 2013 for a major upgrade and will restart operations in 2015. MAST is one of the world leading fusion spherical devices and one of the few experiments in Europe that will be supported in the years to come by Euratom on the roadmap to ITER. ITER is an international fusion device under construction in southern France aimed at proving the viability of fusion as an energy source. The measurement of the neutron emission, both its yield (neutrons emitted per second) and spatial distribution, provides a direct indication of the fusion reaction rate, and therefore how far the reactor is from self-sustainment, and how this is affected by perturbations in the fusion plasmas. Typically, the neutron yield depends on many different plasma parameters such as its density and temperature and this dependence is usually expressed in terms of so-called scaling laws.

Within the group's activity, there is an opening now for a degree project aimed at determining, for the first time, the experimental scaling law governing the neutron yield emission on MAST in terms of plasma current, density, temperature, additional heating power, equilibria and energetic particles diffusion coefficient. The derived scaling law will be interpreted with physical models of the neutron emission. This degree project will give the opportunity to work in close contacts with both the whole group (which is also responsible for two neutron spectrometers at JET, the largest fusion device in the world at present and the only one capable of DT reactions) and the MAST team. In addition, the student will have the opportunity to become familiar with interpreting fusion plasma discharges and with two of the most common neutron diagnostics used in fusion experiments: the fission chamber and the liquid scintillator.

The work consists in analysing and characterizing a large set of MAST plasma discharges: access to the MAST computer system and database will be provided. Good knowledge of Linux, Octave and general programming techniques is advantageous and so is having attended courses in plasma physics, nuclear physics and nuclear laboratory physics. Good command of written and spoken English is required (level B2 according to the Europass scale: http://europass.cedefop.europa.eu/en/resources/european-language-levels-cefr).

Start date
Upon agreement.

Contacts

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