

Seminar Room, Thursday, October 21, 2008

Speaker: **Maarten de Bock, UKEA**

Title: **“MSE on MAST”**

*Or how to measure a current profile in a 15.000.000 C plasma without burning your fingers*

A Motional Stark Effect (MSE) diagnostic can be used in tokamaks to measure the pitch angle of the magnetic field, from which the poloidal magnetic field and the current distribution can be deduced. It analyses the light emitted by neutral beam particles. Due to the neutral particle velocity  $v$ , with respect to the magnetic field  $B$ , the particle experiences a Lorentz electric field  $E_l = v \times B$ . Together with the electrostatic field  $E_s$ , this yields a total electric field  $E = E_l + E_s$  that causes degenerate energy levels of the neutral beam particles to split up, with multiple emitted transition lines as a result. The transition lines can be divided in 2 groups: pi and sigma, that emit light polarised parallel and perpendicular to the electric field respectively. Examining the polarisation of the emitted pi or sigma light thus reveals the angle of the electric field and consequently the pitch angle of the magnetic field (assuming  $v$  and  $E_s$  are known).

Measuring the polarisation of the pi or sigma light requires the Stark spectrum to be well resolved. For conventional tokamaks this usually is the case. For spherical, small aspect ratio machine like MAST, however, the pi and sigma emission lines completely overlap, making an MSE diagnostic more challenging.

This talk will give an overview of the principle of MSE measurements, briefly discuss the specific challenges that were encountered when implementing the new MSE diagnostic on MAST and present the first data obtained with the new diagnostic. (The latter might look familiar to those who visited the IAEA conference last week).