GEC09-2009-020088

Abstract for an Invited Paper
for the GEC09 Meeting of
the American Physical Society

Electron heating in inductive discharges[1]

GERJAN HAGELAAR, LAPLACE, Université de Toulouse

Radio-frequency inductive discharges are used to sustain plasma in negative ion sources for neutral beam injection [W. Kraus et al 2002 Rev. Sci. Instrum. **73**, 1096] currently under development for the ITER fusion experiment. To accompany the experimental development, a comprehensive numerical model is being developed, describing the main physical principles of these sources self-consistently: inductive coupling and electron heating in the source drivers, magnetised plasma transport in the source body, negative ion extraction across a magnetic filter, low-density neutral flow and depletion by the plasma, chemistry of negative ion creation in the volume and at the surface, etc. In this presentation we discuss the principles and modelling of the inductive electron heating in these sources. In particular, we propose a simple method to describe the anomalous skin effect through a fluid equation for electron momentum including a viscosity term with an effective viscosity coefficient. We also discuss the effects of the static and radio-frequency magnetic fields on the inductive coupling and the consequences for the plasma properties.

[1]This work is supported by the ANR (National Research Agency) under contract BLANC08-2_310122, by the ITER Federation, and by the French Atomic Energy Commission (CEA).