Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Modeling of the negative ion source for the ITER neutral beam heating system[1] NICOLAS KOHEN, JEAN-PIERRE BOEUF, GERJAN HAGELAAR, GWENAEL FUBIANI, LAPLACE (LAboratoire Plasma et Conversion d Energie), CNRS and Universite de Toulouse — The injection of energetic neutral deuterium atoms will be one of the major heating methods of the ITER plasma. The 1 MeV, 16.5 MW neutral atom beam will be obtained by acceleration and collisional neutralization of negative ions extracted from an inductively coupled low temperature plasma source. In this paper we present the first results of a 2D fluid/hybrid model of the driver, expansion chamber and magnetic filter for an H_2 plasma, in the conditions of the ITER negative ion source. We discuss the general plasma properties: plasma density, electron and neutral particle temperatures, ion composition (H^+, H_2^+, H_3^+), dissociation degree of H_2, and the effect of the magnetic filter, in a large range of input power (10-80 kW) and source pressure (0.2-0.8 Pa). The results show a decrease of the gas density when the plasma is turned on, due to gas heating and to the neutral gas depletion induced by ionization. The low gas density leads to high electron temperature in the driver, and to saturation of the plasma density growth with power. The simulation results are globally consistent with recent experiments on the negative ion source developed at IPP Garching.

[1]Supported by the ANR (BLAN08-2-310122), CEA, and EFDA.

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Date submitted: 09 Jun 2010 Electronic form version 1.4