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Modelling of Negative Ion Production and Extraction from a Magnetized Plasma Source: insights from low density calculations GWENAEL FUBIANI, JEAN-PIERRE BOEUF, LAURENT GARRIGUES, LAPLACE CNRS University of Toulouse — Negative ion sources are used in a wide variety of research fields and applications such as in tandem type electrostatic accelerators, cyclotrons, storage rings in synchrotrons, nuclear and particle physics and in magnetic fusion devices. In the latter, negative ions are generated mainly on cesiated metal surfaces as a byproduct of the bombardment of hydrogen or deuterium atoms. The ion source is magnetized and the plasma has typically an asymmetric profile [1]. In this work, we will discuss the physical mechanisms associated with the production and transport of negative ions both inside the plasma of a fusion-type ion source and the accelerator vessel [1,2], principally: (i) how does the plasma affect the extraction and properties of the negative ion beam? (ii) is it possible to model the ion beam transport with a lower plasma density, without any loss of generality? (a lower density relaxes the constraint of resolving numerically a micrometre size Debye length on a mesh and hence greatly speed-up the calculation) and lastly (iii) how does the plasma asymmetry affects the shape of the meniscus. The simulations are performed with a 2.5D Particle-in-Cell algorithm with Monte-Carlo Collisions (PIC-MCC).

[1] G. Fubiani et al., New J. Phys. **19**, 015002 (2017)

[2] G. Fubiani et al. Phys. Plasmas **25**, 023510 (2018)

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