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## Particle model of the driver of ITER NBI system

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The Neutral Beam Injection (NBI) heating system of ITER tokamak is a key stage for the yield of the full fusion machine. The NBI yield in turn strongly depends on the performance of the first component of the system, the negative ion source of D<sup>-</sup> ions.

This negative source starts with a “driver region” where a RF discharge is induced in the deuterium gas and a plasma is created. The sources of this kind are therefore referred as Inductively Coupled Plasma –Radio Frequency (ICP-RF) sources. The formed plasma expands in a larger chamber and is then extracted.

While several simulation tools have been developed for the expansion and extraction regions, a full simulation of the driver region is still lacking, mainly because of the difficulties created by the self-consistent inclusion in the codes of the inductive coupling of the RF frequency with the plasma.

For this reason we developed a 2.5D Particle-In-Cell Monte-Carlo-Collision (PIC-MCC) model of a cylindrically symmetrical ICP-RF source, keeping the grid spacing and time step of the simulation small enough to respectively resolve the Debye length and the plasma frequency scales. We report the results of these simulations, which require a massive parallelization, and give some details about the computational side. This is a first step for the modelling of the full negative ion source.

### Eligible for student paper award?

No

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