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Short_Oral_28: Characterization of Cs-free negative ion production in the ion source SPIDER by Cavity Ring-Down Spectroscopy

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The Neutral beam Injectors of the ITER experiment will be based on negative ion sources for the generation of beams composed by 1 MeV H/D particles. The prototype of these sources is currently under testing in the SPIDER experiment, part of the Neutral Beam Test Facility of Consorzio RFX, Padua. In SPIDER, the negative ions are extracted and accelerated from the source by means of a three grids acceleration system. Among the targets of the experimentation in SPIDER, it is of foremost importance to maximize the extracted beam current density, while minimizing the fraction of electrons co-extracted from the source. This requires to adjust several source parameters, as the gas pressure, the input radiofrequency power sustaining the plasma, and the magnetic and electric fields generated in proximity of the grid facing the source plasma to reduce the amount of co-extracted electrons and the electron-ion stripping reactions. This study was performed thanks to a Cavity Ringdown Spectroscopy diagnostic, which is able to give line-integrated measurements of negative ion density in proximity of the acceleration system apertures. The study, which is here presented, was performed operating SPIDER in hydrogen and deuterium; in this first phase of experimentation, negative ions are mostly produced by reactions in the plasma volume since the source operates in Cs-free conditions.

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