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Alternative New Concept of an Efficient Negative Ion Source for Neutral Beams

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Negative ion sources are a key component of neutral beam Injection systems, which are used in fusion experiments to raise the plasma parameters close to start ignition. A novel concept for a negative ion source based on existing well tested Hall thrusters (HT) is presented. The thruster scheme is modified in order to maximize the hydrogen dissociation so as to produce an atom flux at an energy optimized to maximize the yield of negative ions when impinging on a low work function surface. The novel concept can in principle offer several advantages among which a limited amount of co-extracted electrons, a more uniform generation of negative ions and a lower rate of destruction of negative ions. In this contribution the numerical simulations aimed to identify the optimum geometry, magnetic field map and operational parameters of the source are presented discussing the effect of the HT working point on the dissociation rate. A preliminary design of the experimental equipment is also presented including the ion source and the vacuum chamber, focusing on the aspects related to the gas injection and the operational pressure and describing the main diagnostics.

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