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High beam energy recovery simulations for space charged based collector in Neutral beam injection application

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Energy recovery of residual ions may be needed to increase the energy efficiency of Neutral Beam (NB) injectors for fusion plants as DEMO while a deflection-based system has been proposed. A compact beam energy recovery system, composed of 2 Farady Cups (FC) with holes for D0 passage, based on space charge effects, very effective to recover ions with low residual energy, has been proposed recently to replace the Electrostatic Residual Ion Dump (ERID) designed for ITER to dump the residual D- and D+ before the NB injection in the tokamak plasma [1]. New more accurate simulations on the proposed recovery system, however, presented some collection efficiency problems for very high initial beam kinetic energy (Eki=0.5÷ 1 MeV) when a very low residual (few keV) energy in the planned device. In this contribution, all parameter tunings for optimized simulation results are described and discussed. The collection of high Eki ions at low energy (a few percent of the full neutral beam energy Eki) remain possible although it could be done with lower efficiencies.

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