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Space Charged Based Residual Ion Beam Recovery for the Neutral Beam Injection

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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 up to now to dump residual ions. As an alternative, a compact beam energy recovery system, based on space charge effects due to the residual ion deceleration into 2 Farady Cups (FC) with holes for D0 passage, can replace the Electrostatic Residual Ion Dump (ERID) designed for ITER and DDT projects to dump the residual D- and D+ before the NB injection in the tokamak plasma. All parameter tunings and simulation are here described, also providing the suppression of backstreaming to the ion source. Ion energy spread E_d and rectangular geometry are considered. Collection of ions at low energy (a few percent of the full neutral beam energy K_i) instead of K_i as in ERID gives advantages that will be discussed.

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