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Simple beam energy recovery as alternative to Residual Ion dump in Neutral Ion Beam Injections

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The Neutral Ion Beam Injection will be used to further heat the plasma temperature to reach the ignition of the fusion reaction to producing energy in ITER project and some energy efficiency is required. Recently a very simple beam energy recovery based on space charge effect has been proposed as an alternative to the Electrostatic Ion Dump since had some advantages in removing the residual ion after the negative beam neutralization [V. Variale et al, Rev. Sci. Instrum. 91, 013516 (2020)]. Preliminary simulation results showed that the proposed device was able to remove all the residual ions by collecting them at very low energy on proper electrodes. Further simulations with more accurate space charge calculations were needed to confirm the high residual ion collection efficiency obtained in the preliminary simulations of ref. [V. Variale et al, AIP Conference Proceedings 2052, 070006 (2018)]. In this contribution, new simulation results with a code that perform more accurate space charge calculations will be presented. The more accurate space charge calculations presented here suggest some modification on the previous collector model to increase the ion collection efficiency. Further ion recovery simulations with the modified collectors have been also presented and discussed. The proposal of the experimental test foreseen for that device on a scaled ion beam source will be also updated.

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