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Charge breeder development for HIE-ISOLDE and future ISOL facilities.

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In this paper we report on our results from the design study of an advanced EBIS-based Charge Breeder (ECB). The ECB should fulfill the requirements of the HIE-ISOLDE upgrade, and if possible be adapted for ion injection into TSR@ISOLDE, as well as serve as an early prototype of a future EURISOL ECB. Fulfilling the HIE-ISOLDE/TSR@ISOLDE specifications requires simultaneous increase in electron beam energy, current and current density in order to provide the requested beams with proper charge state, high intensity and with a specified pulse repetition rate.

We have carried out a study on the technical requirements of the ECB from the charge breeding performance point of view. The obtained parameters were optimized to comply with technical limitations arising from the electron beam technology and plasma physics in an ECB.

A prototype electron gun of BNL design was built at CERN for the future ECB. It has been tested in cooperation with BNL and undergone a couple of development iterations. Until now, we have reached approximately 50% of the required electron current and energy specification for an HIE-ISOLDE ECB. The gun is undergoing further development in order to improve the beam quality, allow for an increase in current and energy, and to validate the beam compression performance.

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