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EBIS debuncher performances

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Charge breeding by Electron Beam Ion Source (EBIS) is an important technique for preparation of radioactive beams for further post-acceleration. The most efficient mode of the EBIS is pulsed mode. Depending on different parameters the characteristic time of the charge breeding process is of order of ~ 10 ms to ~ 100 ms, while the extraction time is $10 \mu\text{s} - 100 \mu\text{s}$.

However, from the experimental point of view, continuous wave (CW) beams are preferred since bunched beams of the same average intensity tends to have larger pile-up probability, dead-times, and random coincidences in the detectors due to the higher instantaneous counting rate at the moment of the beam bunch arrival. One of the goals of the Innovative Charge Breeding Task (ICBT) of the EURISOL JRA within ENSAR2 is the development of a debuncher device for CW ion beam formation at future ISOL facilities using the EBIS charge breeding technique.

The EBIS debuncher was developed and commissioned at LPC Caen within the EMILIE project [1]. It has been lately tested, thoroughly and successfully, with stable $7\text{Li}+1$ beam on the LPC Caen test bench. Trapping lifetimes well beyond 1 s could be measured, and continuous extracted beams with intensity variations of $\pm 20\%$ could be obtained for extraction times as long as 800 ms. Projections for the use of such device with an operational EBIS, i.e. for HIE-ISOLDE or for a future EBIS at GANIL, are therefore encouraging. This contribution will describe the results of the test and the possible opportunities it offers for future EBIS setups.

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[1] Optimizing charge breeding techniques for ISOL facilities in Europe: Conclusions from the EMILIE project, P. Delahaye, A. Galatà, J. Angot, J. F. Cam, E. Traykov, G. Ban, L. Celona, J. Choinski, P. Gmaj, P. Jardin, H. Koivisto, V. Kolhinen, T. Lamy, L. Maunoury, G. Patti, T. Thuillier, O. Tarvainen, R. Vondrasek, and F. Wenander, Rev. Sci. Instrum., 87, 02B510 (2016)

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