Target Ion Source and Charge Exchange Cell development of the EXCYT facility

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The EXCYT facility at the INFN-LNS is based on a K-800 superconducting cyclotron injecting stable ion beams into a Target Ion Source (TIS) assembly to produce the required nuclear species, and on a 15 MV Tandem for post-accelerating the radioactive beams. For some ion beams such as for Li, the extraction efficiency from the TIS is higher when obtained by positive ionisation, while the injection into the Tandem is suitable only after a charge exchange to obtain negative ions.

In this work we present the operational procedure together with the results of the production of $^{6,\ 7,\ 8,\ 9}$Li beams extracted at EXCYT during the last year. The production of the RNB were performed by injecting a $^{13}C^{4+}$ primary beam of 45 MeV/u on a graphite target. The maximum beam power was 75W while the ionisation was achieved by a W positive surface ioniser. The Li^{+} has been produced at different energies to cross-check the transmission and the charge exchange efficiency. To perform the conversion from positive to negative ions we employed a Charge Exchange Cell (CEC) containing Cs vapours. The Li beam interacts with the latter in a two-step reaction, thus converting its charge from +1 to –1. The CEC was already been characterised during off-line tests; the results obtained at EXCYT confirmed both the isotopic shift effect and the efficiency values at several given extraction energies. Future improvements of the TIS and the CEC are discussed.