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EXCYT: the RIB Facility at INFN-LNS

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EXCYT (EXotics with CYclotron and Tandem) is a ISOL facility located at INFN-LNS to produce and accelerate radioactive ion beams. The primary heavy ion beam provided by the K-800 Superconducting Cyclotron (up to 80 MeV/amu, 1 pμA) generates, in a target-ion source complex (TIS), the required nuclear species which will be post-accelerated by the 15 MV Tandem.
For some ion beam such as for Li, the higher extraction efficiency from the TIS is obtained by positive ionisation. Then the injection into the Tandem is suitable only after a charge exchange (CEC) to obtain negative ions.

The commissioning of the facility has been concluded by delivering a 8Li beam to the BigBang experiment at 28.1 MeV and 10.2 MeV. The production of the radioactive lithium (8,9) beams were performed by injecting a 13C4+ primary beam of 45 MeV/amu on a graphite target up to a beam power of about 150W, while the ionisation was achieved by using a Tungsten positive surface ioniser. The maximum 8Li yield obtained was about 1×107 pps, however the need of the charge exchange and an unexpected low transmission in the tandem coupling line and through the tandem decrease this maximum yield at the experimental point to a few 104 pps.
We are confident to decrease such losses matching the design calculations by adding more diagnostics and with a fine realignment of the magnetic elements. However, the tandem transmission efficiency will be always affected by the terminal voltage: values ranging between 10-37% have been obtained during the commissioning by changing the terminal voltage between 2.5 to 7MV.

The charge exchange process has been characterised off-line and the results obtained at the EXCYT facility confirm our previous observations and expectations such as the efficiency at different beam energies and the isotopic shift effect. Since the CEC showed an increase of efficiency by decreasing the lithium beam energy, we decided to lower the TIS extraction. The best operating point was found experimentally at 10 kV permitting to obtain higher CEC efficiency (3.6% circa) with negligible beam losses over the HV platforms with respect to higher Li beam energy.

Finally, a presentation of the facility will be given with particular concern to the TIS, to the CEC and to the results of lithium beams production together with the future improvements and plan.

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