“Experiments with RIBs at ACCULINNA-1/ACCULINNA-2 fragment separators”
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Study of the beta-delayed alpha branch of $^{11}\text{Be}$ proposed by the Warsaw University team was done in February 2018 at the ACCULINNA-1 setup. The method based on the RIB implantation into an optical time-projection chamber was successfully applied. Data collected for the case of $^{11}\text{Be}$ ($T_{1/2} = 13.76 \text{ s}$) and for other isotopes, $^{8}\text{Li}$ ($T_{1/2} = 0.84 \text{ s}$), $^{8}\text{B}$ ($T_{1/2} = 0.77 \text{ s}$) and $^{9}\text{C}$ ($T_{1/2} = 0.126 \text{ s}$), were used for the crosscheck measurements showing that the method works well even in the case of long-lived nuclei.

In spring, the first experiments were carried out with the RIBs obtained from the new fragment separator ACCULINNA-2 at the U-400M cyclotron. The fragmentation reaction $^{15}\text{N}$ (49.7 AMeV) + Be (2 mm) was used for the production of intensive $^{6}\text{He}$ and $^{9}\text{Li}$ RIBs. The RIBs with intensity $\sim 10^5$ pps, energy $\sim 25$ AMeV and purity $\sim 92\%$ were focused on the CD$_2$ physical target in a spot with a $\sim 17$-mm diameter (FWHM). The $^{6}\text{He} + \text{d}$ experiment, aimed at the study of elastic and inelastic scattering in a wide angular range ($\theta_{\text{cm}} = 25 \div 130$ deg.) was done with a good statistics during a two-week exposition. Preliminary results of these measurements will be presented. Parameters of optical potential needed for the study of $^{6}\text{He}$ interaction with deuterium nuclei were in the sphere of interests.

Another task with $^{6}\text{He}$ projectile, the $(\text{d},^{3}\text{He})$ reaction chosen to populate the $^{5}\text{H}$ ground and exited states, was the subject of a one-week run. Data collected are necessary to check an approach assuming the detection of coincidences between the reaction products moving forward, at lab angles $0 < 20$ deg. These are the low-energy $^{3}\text{He}$ (E=$8.5 \div 11.5$ MeV) and fast tritons (E= $117 \div 121$ MeV). The key stone of the $^{3}\text{He}$ detection was a $\Delta E$-E telescope consisting of two Si detectors – a 20-micron SSD and a 1000-micron DSSD. Based on the preliminary data analysis we conclude that the telescope separates well the $^{3}\text{He}$ events in presence of $^{4}\text{He}$ background. This method will be applies in a flagship experiment dedicated to the search for the enigmatic nucleus $^{7}\text{H}$ produced in the $^{8}\text{He} + \text{d} \rightarrow ^{3}\text{He} + ^{7}\text{H}$ reaction. The study of the $^{7}\text{H}$ and its $4\text{n}$-decay in the reaction $^{8}\text{He}(\text{d},^{3}\text{He})^{7}\text{H}$ is proposed for the fall 2018.

Finally, a run carried out this spring was focused on the study of low-lying states of $^{10}\text{Li}$ populated in the reaction $^{9}\text{Li}(\text{d},\text{p})^{10}\text{Li} \rightarrow \text{n} + ^{9}\text{Li}$. The principal issue of this experiment was the registration of protons, emitted backward in lab system, in coincidence with neutrons moving in forward direction. The data obtained during a half-week exposition are analyzed for the estimation of experimental efficiency, energy resolution and background conditions for such kind measurements at ACCULINNA-2.