"Experiments with RIBs at ACCULINNA-1/ACCULINNA-2 fragment separators"

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Study of the beta-delayed alpha branch of ^{11}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}Be ($T_{1/2}$ = 13.76 s) and for other isotopes, ^{8}Li ($T_{1/2}$ = 0.84 s), ^{8}B ($T_{1/2}$ = 0.77 s) and ^{9}C ($T_{1/2}$ = 0.126 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}N (49.7 AMeV) + Be (2 mm) was used for the production of intensive ^{6}He and ^{9}Li RIBs. The RIBs with intensity ~10^5 pps, energy ~25 AMeV and purity ~92% were focused on the CD_2 physical target in a spot with a ~17-mm diameter (FWHM). The ^{6}He + d experiment, aimed at the study of elastic and inelastic scattering in a wide angular range (θ_{cm} = 25 ÷ 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}He interaction with deuterium nuclei were in the sphere of interests.

Another task with ^{6}He projectile, the (d,^{3}He) reaction chosen to populate the ^{5}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 $\theta < 20$ deg. These are the low-energy ^{3}He (E=8.5 ÷ 11.5 MeV) and fast tritons (E= 117 ÷ 121 MeV). The key stone of the ^{3}He detection was a ΔE-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}He events in presence of ^{4}He background. This method will be applies in a flagship experiment dedicated to the search for the enigmatic nucleus ^{7}H produced in the $^{8}He + d \rightarrow {}^{3}He + {}^{7}H$ reaction. The study of the ^{7}H and its *4n*-decay in the reaction $^{8}He(d,^{3}He)^{7}H$ is proposed for the fall 2018.

Finally, a run carried out this spring was focused on the study of low-lying states of ^{10}Li populated in the reaction $^{9}Li(d,p)^{10}Li \rightarrow n+^{9}Li$. 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.