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A new in-flight fragment separator Acculinna-2 at the U-400M cyclotron in FLNR for experimental evidence of unbound 7H

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RIBs (Radioactive Ion Beams) research is an important direction in modern Nuclear Physics to provide full coverage of the nuclear chart for nuclear-stable isotopes and to promote our knowledge to the limits of nuclear structure existence. The information obtained in the RIB studies is indispensable to resolve fundamental problems of nuclear physics (structure, reactions, origins of the nuclear forces) and nuclear astrophysics (nucleosynthesis, properties of the neutron matter). How do protons and neutrons make stable nuclei and rare isotopes? What are properties of neutron matter? What are the heaviest nuclei that can exist? The nuclear structure and reaction mechanisms are being done more than ever, radioactive isotope beams brought the discovery of new forms of nuclei such as the neutron halo and neutron skin by using an in-flight method with a magnetic spectrometer, which leads a wide range of radioactive nuclei is produced as projectile fragments.

ACCULINNA-2 is a part of Dubna Radioactive Ion Beam (DRIBs) project. It is a new in-flight facility at the U-400M cyclotron developed for studies of exotic nuclear systems with atomic number Z<20. At ACCULINNA-2, the use of secondary beams of radioactive nuclei considerably widens the possibilities to investigate the properties of atomic nuclei and nuclear reactions: investigation of the properties of atomic nuclei far from the stability line, including nuclei at the neutron drip-line, study of the peculiarities of the dynamics of nuclear reactions induced by neutron-rich nuclei, synthesis and study of the properties of new elements and isotopes. The new facility fragment separator ACCULINNA-2 was put into operation at the beginning of 2015 in FLNR, JINR. The new separator is applicable to study of the structure of light unstable nuclei and resonant reactions for astrophysical studies. The 8He secondary beam was successfully produced with a high intensity of 10 4 particle per second and a purity of 87% at 26 MeV/amu by using the in-flight method for experimental evidence to observe the resonance state of unbound nuclei 7H.

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