

# APPLICATION OF THE VACUUM-INSULATED TANDEM ACCELERATOR FOR NUCLEAR REACTIONS CROSS-SECTIONS MEASUREMENTS

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The tandem electrostatic charged particle accelerator of the unique design, called the Vacuum Insulated Tandem Accelerator (VITA), was proposed, created, and is now in operation at Budker Institute of Nuclear Physics. The accelerator generate stable direct current proton or deuteron beams with the energy up to 2.3 MeV and the current up to 10 mA. It is equipped with  $\gamma$ -,  $\alpha$ -, and neutron spectrometers and dosimeters. The accelerator is used for the development of boron neutron capture therapy of malignant tumors, radiation testing of promising materials, and more recently for measuring cross-sections of nuclear reactions. The credible values of the cross-sections are important for many applications.

For measuring the cross-sections of nuclear reactions the reliable determination of the linear thickness of atomic nuclei, interacting with the charged particle beam, and impurities, affecting the charged particle braking rate, is crucial. The difficulty in determining these parameters may explain the considerable variation in the nuclear reactions cross-sections data provided by different groups of researchers.

The study presents the results of the cross-sections measurements of a number of nuclear reactions and pays special attention to the description of the methods used to measure the thickness and elemental composition of thin investigated layers irradiated by a beam of protons or deuterons. The usability of these methods and their accuracy are discussed; the comparison of the results obtained is given. The proposals for the development of the diagnostic tools of the facility for further measurements of nuclear reactions cross sections are discussed.

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