SUSTAINABILITY OF THE TANDEM ACCELERATOR FACILITY AT THE RUĐER BOŠKOVIĆ INSTITUTE

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The Laboratory for Ion Beam Interactions (LIBI) at the Ruđer Bošković Institute (RBI) began with operation in 1987, when the first ion beam was obtained from a 6 MV tandem Van de Graaff accelerator donated by the University of Houston (Texas). The first beam lines were installed for Rutherford Backscattering (RBS) and Particle Induced X-ray Emission (PIXE) experiments mainly done by proton beams. To extend the applications to lower MeV ion energy range and to increase the number of beamlines, an additional 1 MV Tandetron accelerator was installed in 2005 in collaboration with the IAEA under the TC project. The main sources of funding for the operating costs of the laboratory at that time were secured through the Croatian Ministry of Science and a beamline agreement with the IAEA.

In the following period of ten years (2008 - 2017), the LIBI equipment was further upgraded through the numerous projects from various sources (EU, IAEA, national funds, etc.). The acquisition of new ion sources opened the possibility to use different ions in the broad mass range, the modernization of the vacuum system resulted in better transmission of the ion beam, and the computerised accelerator control built in house enabled remote control of the accelerator. Funds from the international and national projects also provided the opportunity to employ young researchers (PhD students and postdoctoral fellows) boosting development of existing and new unique IBA techniques such as dual beam irradiation, heavy ion microbeam, IBIC, HR-PIXE, TOF-ERDA, MeV SIMS, etc. These new emerging techniques as well as other traditional IBA techniques have been successfully applied for applied research in the fields of materials science, detector physics, biology, forensics, cultural heritage, etc., thus opening a large space for the interdisciplinary collaboration between scientists from Croatia and abroad. By mastering new and unique techniques for ion beam analysis and modification, LIBI has gained international recognition and become involved in large international projects such as SPIRIT, RADIATE, AIDA2020, EUROfusion and CERIC-ERIC consortium which allow researchers (and industry) to use accelerator beamtime at LIBI through the transnational access.

The growth of the laboratory over the past 20 years, both in terms of staff and expertise offered in accelerator-based techniques, entails operating costs that cannot be covered by limited government base funding alone. Therefore, to maintain normal operation and further developments, accelerator facilities such as ours must constantly compete for the international funds through the EU projects and collaboration with industry. To further develop the laboratory and open up new research areas (such as quantum sensing and computing and neutron physics), construction of a new accelerator hall, followed by the purchase of a new 6 MV accelerator, will begin in 2022 as a part of the RBI's EU structural project O-ZIP. In addition, a new low-energy implanter (200 kV) will be built by own funds and knowledge, opening the possibility to explore new techniques with low-energy ions. All of this together opens up a space for new projects that will further fund the development of the laboratory, ensuring that LIBI remains one of the world's leading laboratories in the field of ion beam analysis and materials modification, reaching self-sustainability in terms of manpower, education of young researchers and facility operating costs.