β-DECAY STUDIES OF R-PROCESS NUCLEI USING THE ADVANCED IMPLANTATION DETECTOR ARRAY

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The origin of the heavy elements is one of the most fundamental and interdisciplinary open questions in modern astrophysics, with a notable difficulty being the lack of a complete description of the rapid neutron-capture process (r-process) [1]. Beta-decay half-lives are a critical input for r-process calculations. The half-lives determine the timescale for the flow of matter to heavy isotopes, and isotopes near neutron shell closures, with longer half-lives closer to stability, act as waiting points resulting in the observed r-process abundance peaks. In addition to this, in astrophysical calculations for cold r-process scenarios the path of the r-process is determined by a competition between the timescale for neutron captures and beta decays [2].The Advanced Implantation Detector Array (AIDA) represents the latest generation of silicon implantation detector for use in β-decay half-life and β-delayed neutron emission measurements at fragmentation beam facilities.Thanks to the large yields of neutron-rich isotopes available at RIBF, in the near future it will be used with the BRIKEN neutron detector to conduct studies of r-process nuclei in the mass region of uranium fission fragments. The detector will also be used in the case studies for future experiments at FAIR.
Here we present the first data from commissioning experiments along with data obtained during earlier testing phases.

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