A COMPACT ACCELERATOR DRIVEN NEUTRON SOURCE AT THE NUCLEAR-APPLICATIONS LABORATORY, LUND UNIVERSITY

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The Applied Nuclear Physics Group at Lund University has constructed a prototype CANS (Compact Accelerator-driven Neutron Source) [1,2], which is entering pre-commissioning. The CANS is based around a 3 MV, single-ended, Pelletron accelerator, which is used to direct a 2.5 MeV deuterium beam into a beryllium target. The anticipated neutron production will be on the order of 10^{10} n/s in 4π str. A further upgrade to the ion source of the Pelletron is expected to increase neutron production to 10^{11} n/s. Neutron energy will be up to 7 MeV with peak emission at ~5 MeV. Shielding and moderation will be provided by a large water tank surrounding the target, with exit ports to allow moderated-neutron beams to be directed to experiments. The anticipated thermal-neutron flux at the exit port of the shielding tank is ~10^6 n/cm^2/s. The immediate application of the CANS will be to forward the activities of the group in the area of NAA (Neutron Activation Analysis) [3], as part of a project (SSM2021-787-8) funded by SSM (Swedish Radiation Safety Authority). The project will aim to monitor for the presence of specific radionuclides in environmental samples, taken from around the ESS (European Spallation Source) [4]. In addition to NAA, the CANS will be used: in the develop of novel state-of-the-art instruments and methods for the characterisation of spent nuclear fuel, with the purposes of enforcing nuclear safeguards [5]; to test and categorise detectors for neutron-scattering instrumentation [6]; for work on thermal-neutron tagging [7]; and as an educational platform. The CANS will also be made available to external users. An overview of activities at the Nuclear-Applications Laboratory will be presented, focusing on details of the design and construction of the CANS, as well as its current and future applications. The question of how this and other such small-scale facilities are anticipated to fit in to the future neutron-production infrastructure within Scandinavia will also be addressed.

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