



A compact accelerator driven neutron source at the Applied Nuclear Physics Laboratory, Lund University

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Abstract

The Applied Nuclear Physics Group at Lund University has constructed a CANS (Compact Accelerator-driven Neutron Source). The CANS is based around a 3 MV, single-ended, Pelletron accelerator, which is used to impinge a 2.8 MeV deuterium beam into a beryllium target. The anticipated neutron production will be on the order of 10^{10} n/s in 4π sr, with future upgrades expected to increase neutron production to 10^{11} n/s. Neutron energy will be up to 9 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 neutrons to be directed to experiments. The thermal-neutron flux at the exit of the extraction ports is anticipated to be up to 10^6 n/cm²/s. The CANS will be used to forward the activities of the group in the area of neutron-activation analysis, in addition to a broader range of neutron related applications.

Keywords: CANS; Pelletron; Deuterium beam; Beryllium target

1 Introduction

Since 2014, the Applied Nuclear Physics Group at Lund University has provided access to neutrons [1], with a well-established and user-focused infrastructure, emphasising expertise in nuclear physics and neutron-detection techniques. The use of these neutrons has contributed to materials research [2] and detector development [3] related to the European Spallation Source [4, 5]. The Applied Nuclear Physics group also has a long history of accelerator-based research from the development of PIXE [6] in the 1970s to advanced modern detector systems [7–9] more recently. In 2017, it was decided to combine these areas of expertise and construct a dedicated beamline for neutron production [10]. The new CANS (Compact Accelerator-driven Neutron Source) offers a significant increase in flux over the neutron sources currently used at the laboratory, with an initial neutron-production rate anticipated to be on the order of 10^{10} n/s in 4π sr and a further increase to 10^{11} n/s in 4π sr predicted [11]. The CANS is now entering the commissioning phase and, once fully realised, will be comparable to the Kyoto University Accelerator-driven Neutron

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Applied Nuclear Physics

E Durkheim



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