Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3315** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

A Prototype Compact Accelerator-based Neutron Source for Canada for Medical and Scientific Applications

Monday 6 June 2022 11:15 (15 minutes)

Compact Accelerator-based Neutron Sources (CANS) offer the possibility of an intense source of pulsed neutrons with a capital cost significantly lower than spallation sources. In an effort to close the neutron gap in Canada a prototype, Canadian compact accelerator-based neutron source (PC-CANS) is proposed for installation at the University of Windsor. The PC-CANS is envisaged to serve two neutron science instruments, a boron neutron capture therapy (BNCT) station and a beamline for fluorine-18 radioisotope production for positive emission tomography (PET). To serve these diverse applications, a linear accelerator (or, linac) solution is selected, that will provide 10 MeV protons with a peak current of 10 mA within a 5% duty cycle. The accelerator is based on an RFQ and DTL with a post-DTL pulsed kicker system to simultaneously deliver macro-pulses to each end-station. The neutron production targets for both neutron science and BNCT will be of Beryllium and engineered to handle the high beam power density. Conceptual studies of the accelerator and benchmarking studies of neutron production and moderation in FLUKA and MCNP in support of the target-moderator-reflector (TMR) design will be presented.

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Session Classification: M1-6 Accelerator Developments in Canada (DAPI) | Progrès dans les accélérateurs au Canada (DPAI)

Track Classification: Technical Sessions / Sessions techniques: Applied Physics and Instrumentation / Physique appliquée et de l'instrumentation (DAPI / DPAI)