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Design Considerations for a Proton Linac for a Compact Accelerator Based Neutron Source for Canada

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A prototype Canadian compact accelerator-driven neutron source (PC-CANS) is proposed for installation at the University of Windsor. PC-CANS is designed to produce neutrons for science and BNCT and protons for PET isotope production. The source will utilize a high-intensity compact proton RF linear accelerator, delivering a peak current of 20 mA with a 5% duty factor of protons at 10 MeV to the target. The accelerator comprises a short radio-frequency quadrupole (RFQ) to 3 MeV, followed by a drift tube Linac (DTL) structure accelerating to 10 MeV. Various room temperature DTL variants, including Alvarez, APF, KONUS, CH-DTL, , are considered at a frequency of 352.2 MHz, in addition to a superconducting HWR variant at 176.1 MHz.
This paper compares the beam dynamics of the various structures including RFQ variants at the two frequencies and performance with and without a MEBT. Comparisons include beam transmission, longitudinal and transverse emittance growth, Linac length and longitudinal and transverse phase acceptance.
Beam dynamics simulations were conducted using the PARMTEQ, LANA, PARMILA, and Trace-3D codes. This work contributes to the development of next-generation CANS by providing a comparison in performance over several Linac structures.

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