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The Design of a 6 MeV Deuteron RFQ Accelerator as a Low Energy Neutron Source

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LBNL has developed a core competence in the area of high duty factor, high intensity ion sources and RFQ's. As a partner in building the SNS, LBNL was responsible for the construction of the front end systems that included the ion source, the RFQ, LEBT and the MEBT. The system has successfully delivered 51 mA peak H^- current, at 5% duty factor and 65 keV injection energy, into the RFQ. Recently we have applied this front end technology to pursue other interests in the development and application of low energy neutron sources. For the active interrogation of shielded HEU and Pu in cargo containers, we have designed a compact 6 MeV, 40 mA (at 5% duty factor and 180 Hz) deuterium beam using a deuterium gas target to generate a forward directed neutron flux of up to 2×10^7 n/cm²/s at 2.5 m distance. In this paper we discuss some of the technical challenges in the design of these systems and some of the technical approaches we have developed to address them.