

Ion Source Developments at the SNS

R. F. Welton¹, N. J. Desai², B. X. Han¹, S. N. Murray¹, T. Pennisi¹, K. G. Potter¹,
B. Lang¹, M. Santana¹, and M. P. Stockli¹

¹*Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN, 37831, USA*

²*Worcester Polytechnic Institute, Worcester, MA, 01609, USA*

welton@ornl.gov

The Spallation Neutron Source (SNS) now routinely operates near 1 MW of beam power on target with a highly-persistent 38 mA peak current in the linac and an availability of ~88%. The ~1 ms-long, 60 Hz, ~50 mA H⁻ beam pulses originate from the Cs-enhanced, multi-cusp, RF-driven, internal-antenna ion source. An electrostatic LEBT (Low Energy Beam Transport) refocuses the 65 kV beam into the RFQ. The combined availability of the ion source and LEBT is ~99%.

In order to further increase the availability of the ion source and LEBT, several design efforts are ongoing to improve weak points of the system. This report details some design modifications to the SNS ion sources and LEBT, providing subsequent experimental benchmarks where available. Specifically discussed are modifications to (i) the external antenna source: alternative RF plasma gun for source ignition; an improved multi-cusp confinement array; a ferrite-backed RF antenna, (ii) the baseline source: spark resistant electron dump feedthroughs, (iii) LEBT: prototype extraction system with electron dumping downstream of the acceleration gap.