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Recent H⁻ ion source research and development at the Oak Ridge National Laboratory

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Abstract. The U.S. Spallation Neutron Source (SNS) is a state-of-the-art neutron scattering facility delivering the world's most intense pulsed neutron beams to a wide array of instruments which are used to conduct investigations in many fields of science and engineering. Neutrons are produced by spallation of liquid Hg by bombardment of short (~ 100 ns), intense (~ 40 A) pulses of protons delivered at 60 Hz by a storage ring which is fed by a high-intensity, 1 GeV H⁻ LINAC. This facility has operated almost continuously since 2006, with ion source performance increasing over those years, and now currently providing 50-60 mA of H⁻ ions with a duty-factor of 6% for maintenance-free runs of several months with near 100% availability. Ion source research and development at ORNL has played a key role in enabling and supporting this success: this report provides an update on ongoing ion source research and development efforts which have been undertaken since the previous NIBS conference in 2020. These include improvements to the plasma ignition gun and dual frequency excitation of the external antenna ion source; upgrades to the ion source RF and electrical systems; incremental improvements to the ion source extraction system and Low Energy Beam Transport (LEBT) as well as upgrades to the LEBT and beam diagnostic systems.

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