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Operation and Research Activities on the Three H-Injector Systems at the Spallation Neutron Source

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The Spallation Neutron Source (SNS) at the Oak Ridge National Laboratory is an accelerator-based, short-pulse (sub- μs) neutron production facility for a broad range of scientific applications. A 65-keV H⁻ injector consisting of an rf-driven H⁻ ion source and an electrostatic low energy beam transport section delivers high-current (>50 mA), time-structured (60 Hz, 1.0 ms macro-pulse divided into \sim 1000 mini-pulses of < 1 μs in length) H⁻ beam to the SNS accelerator complex. In the recent five production run cycles of SNS, a single H⁻ ion source was operated for 3-4 months as scheduled for each run cycle with excellent availability of \sim 99.9%. For the ongoing run started in early May 2022, the ion source is also on track to finish a 95-day operational cycle with high availability. Besides the H⁻ injector on the main accelerator complex, the SNS campus also hosts two similar test injector systems: one is for providing beam for a 2.5-MeV RFQ Beam Test Facility and the other is dedicated for ion source, low energy beam transport, and beam chopper development. The recent R&D activities on these test injector systems, including an optimization study of the ion source electron dumping circuit and improvement in performance consistency among ion sources, will also be presented.

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