

# Advances in the Performance and Understanding of the SNS\* Ion Source

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**Abstract.** The ion source developed for the Spallation Neutron Source\* (SNS) is a radio frequency, multi-cusp source designed to produce ~ 40 mA of H<sup>-</sup> with a normalized rms emittance of less than 0.2 pi mm mrad. To date, the source has been utilized in the commissioning of the SNS accelerator and has already demonstrated stable, satisfactory operation at beam currents of 10 - 40 mA with duty-factors of ~0.1% for operational periods of several weeks. Ultimately the SNS facility will require beam duty-factors of 6% (1 ms pulse length, 60 Hz repetition rate). To ascertain the capability of the source to deliver beams at this duty-factor over sustained time periods, ongoing experiments are being performed in which the ion source has been continuously operated on a dedicated test stand. The results of these tests are reported as well as a theory of the Cs release and transport processes which was derived from these data. The theory was then employed to develop a more effective source conditioning procedure which led to a dramatic improvement in source performance. The theory was also employed to develop a new-concept, direct-transfer Cs collar which also led to a considerable improvement in source performance.

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