Contribution ID: **97** Type: **Contributed Oral**

Advancing H- injector beam intensity frontier at high duty-factor for multi-megawatt proton accelerators

Friday, 12 September 2025 10:40 (20 minutes)

The SNS accelerator complex features a front-end H- injector equipped with an RF-driven H- ion source and an electrostatic low energy beam transport (LEBT) system. Recent advancements in the beam extraction system have successfully increased the H- ion source beam output capability from ~60 mA to ~120 mA, while operating reliably at the routine RF power level of roughly 50 kW and a duty-factor of 6% (1.0 ms at 60 Hz). This enhancement plays a crucial role in the ongoing SNS beam power upgrade from 1.4 MW to 2.8 MW, providing a substantial margin for beam current. Furthermore, a maximum beam current of approximately 150 mA has been achieved by increasing the RF power to about 80 kW.

Current efforts are focused on optimizing the ion source plasma filter field and cesium system to improve H- ion formation efficiency relative to RF power, ultimately further enhancing both beam current output and reliability. Additionally, the development of LEBT systems - both electrostatic and magnetic - aims to ensure robust beam transport and beam chopping even at very high currents. These advancements are expected to yield promising solutions for H- injectors for future upgrades or new developments of multi-megawatt high power proton accelerators.

Primary author: Dr HAN, Baoxi (Oak Ridge National Laboratory)

Co-authors: NARAYAN, Amith (Oak Ridge National Laboratory); PILLER, Chip (Oak Ridge National Laboratory); STINSON, Chris (Oak Ridge National Laboratory); TERSZAKOWEC, Greg (Oak Ridge National Laboratory); THOMAS, Jordan (Oak Ridge National Laboratory); Dr WELTON, Rob (Oak Ridge National Laboratory); Dr KIM, Sang-Ho (Oak Ridge National Laboratory); ANDZULIS, Vic (Oak Ridge National Laboratory)

Presenter: Dr HAN, Baoxi (Oak Ridge National Laboratory)

Session Classification: Oral Session

Track Classification: Negative ion sources and sources for fusion facilities