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Commissoning of the new high intensity 300keV H- injection line at TRIUMF

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A new electrostatic injection for the 500 MeV cyclotron has been designed, constructed, and commissioned. Approximately 40 meters of electrostatic transport now replace the previous injection system, extending from the H^- ion source to the vertical injection section. The upgrade includes the integration of a second H^- ion source, connected through additional electrostatic beam transport, providing operational flexibility and redundancy.

A novel suppression scheme for stray magnetic fields from the cyclotron has been implemented using a continuous, in-vacuum passive mu-metal shield along the full beam transport. Beam bunching is performed with a new three-harmonic buncher, whose amplitude has been calibrated through beam-based techniques. Additional diagnostics were introduced to enable non-interceptive monitoring of beam position.

The injection system operates under ultra-high vacuum (low 10^{-8} Torr), achieved through the use of stainless steel and ceramics materials and all-metal seals. The upgrade also incorporates a next-generation multi-cusp H^- ion source, developed at TRIUMF, which delivers higher brightness and improved stability.

During commissioning, new high-level software applications for online tuning were deployed. These tools are now integrated into routine operation, providing enhanced automation and reproducibility of tuning procedures. Overall, the new injection system significantly improves the robustness, flexibility, and performance of cyclotron operations.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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