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Optimization for RF-driven H- source and low energy beam transport for CSNS-II

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The RF-driven H^- ion source has demonstrated a maintenance interval exceeding 7500 hours with nearly 100% availability. To achieve the goal of delivering 500 kW beam power to the spallation target, as required by CSNS-II, the beam current from the ion source must be increased while minimizing the beam emittance. Research on beam intensity, space charge compensation, and stripped proton beam elimination has been conducted on the test bench with a new LEBT. This report presents the latest experimental results from these studies, along with the issues encountered during commissioning. A key focus of this work is the elimination of the stripped proton beam in the LEBT section, achieving a proton-to-H^- ratio below 0.01%. This reduction minimizes the heat load and radioactivity induced by stripped proton losses in the superconducting linac section planned for CSNS-II.

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