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Sustainability Issues and Improvements in Long-Term Operations with Negative Hydrogen Ion Sources for Particle Accelerators

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High brightness, negative hydrogen ion sources are used extensively in many scientific facilities operating worldwide. Negative hydrogen beams have become the preferred means of filling circular accelerators and storage rings. Several facilities now have long-term (>several years) experience with operating a variety of these sources (RF, filament, magnetron and penning) and have encountered, and in some cases solved, performance limiting issues. A representative list of such facilities includes, the US Spallation Neutron Source (SNS), Japan Proton Accelerator Complex (J-PARC), Rutherford Appleton Laboratory (RAL-ISIS), Los Alamos Neutron Science Center (LANSCE), Fermi National Accelerator Laboratory (FNAL), CERN LINAC-4 and numerous installations of D-Pace ion sources. This report summarizes key ion source sustainability issues encountered at these facilities and discusses how some of them are being addressed through recent source improvements.

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