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Commissioning and operation of LEAF with high intensity heavy ion beams

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LEAF (Low Energy Heavy Ion Accelerator Facility) is a high-intensity, low-energy heavy-ion accelerator complex that features a high-performance superconducting ECR (Electron Cyclotron Resonance) ion source and a high-current, room-temperature linear accelerator. The facility delivers heavy-ion beams ranging from H^{2+} to uranium, with tunable beam energies between 0.3 and 1 MeV/u. Since its trial operation began in 2018, the facility has achieved remarkable beam intensities in continuous-wave (CW) mode, including: $>160 \mu A$ for the ^{16}O ion beam, $>6 \mu A$ for the ^{209}Bi ion beam, and $>45 \mu A$ for the ^{40}Ar ion beam. These beam intensities are among the highest achieved by similar facilities worldwide. Recently, LEAF successfully delivered carbon ion beams with an intensity exceeding $100 \mu A$ and an energy spread of $<0.3\%$ (FWHM) for C-C burning investigations in nuclear astrophysics. Significant results have been obtained. This paper provides an introduction to the LEAF facility.

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