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Simulation of Beam Formation in the CERN Negative Ion Source for the Linac4 Accelerator

Linac4 is the negative hydrogen ion (H^-) injector of the CERN accelerator complex. Modelling of the beam formation is essential for optimizing the current and emittance of the H^- ion source. We exploited the 3D PIC-Monte Carlo ONIX (Orsay Negative Ion eXtraction) code for studying H^- beam formation processes in caesiated negative ion sources. The various geometries of the IS03 prototypes have been implemented into ONIX. The code, designed for neutral injector multi-aperture sources for fusion has been adapted to match the single-aperture extraction region of the Linac4 H^- source. New boundary conditions matching single aperture sources are described in this contribution. A plasma electrode designed to ensure radial metallic boundary conditions was produced and tested. The simulation results of the beam formation region at low plasma density to validate the functionality of the modified ONIX version are presented.

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