Simulation of an expanding plasma using the Boris algorithm[1]

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— We present a Boris algorithm simulation in a
cylindrical geometry of charged particle motion in a helicon plasma confined by a
diverging magnetic field. Laboratory measurements of ion velocity distribution func-
tions (ivdfs) provide evidence for acceleration of ions into the divergent field region
in the center of the discharge. The increase in ion velocity is inconsistent with ex-
pectations for simple magnetic moment conservation given the magnetic field mirror
ratio and is therefore attributed to the presence of a double layer in the litera-
ture. Using measured electric fields and ivdfs (at different radial locations across
the entire plasma column) upstream and downstream of the divergent magnetic field
region, we compare predictions for the downstream ivdfs to measurements. We also
present predictions for the evolution of the electron velocity distribution function
downstream of the divergent magnetic field.

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