

Abstract Submitted
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The effect of a collisional presheath on the Bohm criterion¹ YUZH
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tional Laboratory — The plasma exit flow speed at the sheath entrance is con-
strained by the Bohm criterion. The so-called Bohm speed regulates the plasma
particle and power exhaust fluxes to the wall, and it is commonly deployed as a
boundary condition to exclude the sheath region in modeling. Traditional Bohm
criterion analyses invoke equation of state, and thus ignore transport physics of
both collisionless and collisional origin. Previously we have found that the electron
parallel heat flux has a critical role in setting the Bohm speed. Here we perform
both collisional VPIC simulation and theoretical analysis to decipher the subtle and
important roles of thermal force and energy exchange between the parallel and per-
pendicular degrees of freedom. Although thermal force enters the Bohm criterion
analysis straightforwardly since it is a gradient of temperature, similar to heat flux,
the collisional energy exchange between parallel and perpendicular temperatures is
less obvious. The collisionality dependence of electric field at the sheath entrance
makes this physics important even when the collisionality is lowered. This work
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