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Theoretical and computational studies of the sheath of a planar wall MARTINA GIRAUDO, ENRICO CAMPOREALE, GIAN LUCA DELZANNO, LANL, GIOVANNI LAPENTA, K.U. Leuven — We present an investigation of the stability and nonlinear evolution of the sheath of a planar wall. We focus on the electrostatic limit. The stability analysis is conducted with a fluid model where continuity and momentum equations for the electrons and ions are coupled through Poisson's equation. The effect of electron emission from the wall is studied parametrically. Our results show that a sheath instability associated with the emitted electrons can exist. Following Ref. [1], it is interpreted as a Rayleigh-Taylor instability driven by the favorable combination of the sheath electron density gradient and electric field. Fully kinetic Particle-In-Cell (PIC) simulations will also be presented to investigate whether this instability indeed exists and to study the nonlinear effect of electron emission on the sheath profiles. The simulations will be conducted with CPIC, a new electrostatic PIC code that couples the standard PIC algorithm with strategies for generation and adaptation of the computational grid.

[1] G.L. Delzanno, "A paradigm for the stability of the plasma sheath against fluid perturbations," Phys. Plasmas 18, 103508 (2011).

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