

Abstract Submitted
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Identification of streaming instabilities in the presheath of plasmas with two ion species SCOTT BAALRUD, Department of Physics and Astronomy, University of Iowa, TREVOR LAFLEUR, LPP-CNRS, Ecole Polytechnique — A recent theory proposes that ion-ion two-stream instabilities can arise in the presheath of plasmas with two ion species under certain conditions, and that these instabilities rapidly enhance the frictional coupling between the ion species.¹ The threshold condition for instability onset along with the multi-species Bohm criterion allowed prediction of the speed of each ion species at the sheath edge. These predictions were later confirmed experimentally.² However, recent work has questioned the validity of this theory based on PIC simulations that did not observe instabilities under conditions similar to the experiment.³ Using numerical solutions for the dispersion relation, we show that this discrepancy is due to a lower electron temperature in the simulations. This identifies an inaccuracy with an approximate instability criterion that predicted instability for the simulation parameters.⁴ We thoroughly test this numerically. Additionally, for the first time we identify the ion-ion two-stream instabilities in the presheath using PIC simulations.

¹Baalrud, Hegna and Callen, Phys. Rev. Lett. 103, 205002 (2009)

²Yip, Hershkowitz and Severn, Phys. Rev. Lett. 104, 225003 (2010).

³Gudmundsson and Lieberman, Phys. Rev. Lett. 107, 045002 (2011).

⁴Baalrud, Hegna and Callen, Phys. Rev. Lett.

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