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The Weibel instability beyond the scaling expected for bi-Maxwellian distribution functions: typical anisotropic electron velocity distribution functions in high energy density plasma physics and laser-plasma instabilities THALES SILVA, Instituto Superior Tecnico, BEDROS AFEYAN, Polymath Research Inc., LUIS SILVA, Instituto Superior Tecnico — The Weibel instability is a universal plasma instability driven by velocity distribution function anisotropy. It is inherently a kinetic effect wherein current perturbations in plasmas with anisotropic temperatures will pinch in a way to reinforce the perturbations, leading to an exponentially growing magnetic field. This instability plays a key role in the dynamics of astrophysical objects and also could be part of the seeding mechanism for the magnetic field of the universe. It is widely believed that the temperature (second moment of the distribution function) anisotropy is necessary to observe this instability. In this work, we solve the linear theory dispersion relation and use particle-in-cell simulations with the code OSIRIS to show that an anisotropy of the higher moments of the distribution function can also seed magnetic field growth. We explore the effects of the higher moments of typical distribution functions and parameters that occur in astrophysical and laboratory scenarios. Our emphasis will be on parametric instability modified and non-local heat transport modified electron velocity distribution functions.

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