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**How large can the electron to proton mass ratio be in particle-in-cell simulations of unstable systems?** ANTOINE BRET, Universidad de Castilla-La Mancha, MARK E. DIECKMANN, Linkoping University — Particle-in-cell simulations are widely used as a tool to investigate instabilities that develop between a collisionless plasma and beams of charged particles. However, even on contemporary supercomputers, it is not always possible to resolve the ion dynamics in more than one spatial dimension with such simulations. The ion mass is thus reduced below 1836 electron masses, which can affect the plasma dynamics during the initial exponential growth phase of the instability and during the subsequent nonlinear saturation. The goal of this talk is to assess how far the electron to ion mass ratio can be increased, without changing qualitatively the physics. A criterion allowing to define a maximum ratio is explicated in terms of the hierarchy of the linear unstable modes. The criterion is applied to the case of a relativistic electron beam crossing an unmagnetized electron-ion plasma [1].

[1] Bret A. and Dieckmann M., Phys. Plasmas, **17**, 032109, (2010)

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