

Abstract Submitted
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Shock Formation in Electron-Ion Plasmas: Mechanism and Timing ANTOINE BRET, Universidad de Castilla La Mancha, ANNE STOCKEM NOVO, Ruhr-Universitt, FONSECA RICARDO, SILVA LUIS, Instituto Superior Tcnico — We analyze the formation of a collisionless shock in electron-ion plasmas in theory and simulations. In initially un-magnetized relativistic plasmas, such shocks are triggered by the Weibel instability. While in pair plasmas the shock starts forming right after the instability saturates [1,2], it is not so in electron-ion plasmas because the Weibel filaments at saturation are too small. An additional merging phase is therefore necessary for them to efficiently stop the flow. We derive a theoretical model for the shock formation time, taking into account filament merging in the nonlinear phase of the Weibel instability. This process is much slower than in electron-positron pair shocks, and so the shock formation is longer by a factor proportional to $\sqrt{m_i/m_e} \ln(m_i/m_e)$ [3].

- (1) Bret et al, Physics of Plasmas 20, 042102 (2013).
- (2) Bret et al, Physics of Plasmas 21, 072301 (2014).
- (3) Stockem Novo et al, The Astrophysical Journal Letters, 803:L29 (2015).

Antoine Bret
Universidad de Castilla La Mancha

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