

The role of plasma instabilities in relativistic radiation-mediated shocks

Amir Levinson^{1,†}, Arno Vanthieghem², Jens Mhalmann², Alexander Philippov³, Ehud Nakar¹, Frederico Fiuza⁴

¹ *Tel Aviv university*

² *Princeton university*

³ *CCA*

⁴ *Stanford*

† levinson@tauex.tau.ac.il

Radiation mediated shocks are of great interest because they dictate the properties of the early emission seen in a variety of transient sources, including various types of supernovae, low luminosity gamma-ray bursts, binary neutron star mergers and tidal disruption events. In some of these systems the shock is mildly or even ultra relativistic. In such cases, the structure and emission of the shock is regulated by copious production of electron-positron pairs inside the shock transition layer. Because a substantial abundance of positrons necessarily leads to a velocity separation of the different plasma constituents, the coupling of ions and pairs must involve plasma instabilities, that may actually dominate the shock physics and alter the shock structure and emission. In this talk I'll discuss recent attempts to study the role of plasma instabilities in these shocks using analytic approach and 2D particle-in-cell simulations.