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hedla@tecnico.ulisboa.pt

Radiatively cooled shocks in jets at the MAGPIE pulsed-power facility

Danny. R. Russell[1,†], Ellie R. Tubman[2], Jack W. D. Halliday[1], Jack D. Hare[3], Stefano Merlini[1], Lee G. Suttle[1], Vicente Valenzuela-Villaseca[1], Andrea Ciardi[4,5], Sergey V. Lebedev[1]

[1] *Imperial College, London, UK*
[2] *Lawrence Livermore National Laboratory, Livermore, USA*
[3] *Massachusetts Institute of Technology, Cambridge Massachusetts, USA*
[4] *Observatoire de Paris, Paris, France*
[5] *Sorbonne University, Paris, France*

[†] daniel.russell13@imperial.ac.uk

Highly collimated, supersonic jets are a typical feature of star formation. Magnetic fields are believed to play a key role in the formation and collimation of these jets and will be advected by the propagating jet and surrounding plasma. Shocks are often observed in these systems and range from large scale, high Mach number shocks which form the terminal working surface to smaller scale shocks inside the jet [1]. The shock structures are often highly complex, indicating the important role radiative cooling may have on shock dynamics.

We present a laboratory study of radiatively cooled supersonic plasma jets which are produced by the pulsed-power driven ablations of radial foils at the MAGPIE facility [2]. We investigate shocks both inside the jet and in the surround plasma by placing stationary obstacles into the flow. Detailed measurements of density, velocity and temperature by laser interferometry and Thomson scattering allow the effects of both radiative cooling and the advected magnetic field to be investigated. We observe complex shock structures, similar to those seen in astrophysical observations and investigate the importance of radiative cooling in these systems.

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