



High-Energy-Density Laboratory Astrophysics Using High-power Lasers

Dr. Mario Manuel

As an Einstein Postdoctoral Fellow, I have focused my research towards fundamental HED plasma science relevant to supersonic plasma-jet dynamics in young stellar objects (YSOs). Astrophysical jets have been observed during all stages of low-mass star formation during the accretion process. While the genesis of these jets is still debated within the astrophysics community, our laboratory experiments focus on the dynamics of supersonic plasma flows in a background magnetic field where the dynamic plasma-beta is of order $\sim 1-10$, similar to the astrophysical case. I will discuss our two recent experimental campaigns and the current progress of data interpretation and simulation. This initial work led to my recent participation in the large Astrophysical Collisionless Shock Experiments with Lasers (ACSEL) collaboration where we are developing the means to create collisionless shocks in the laboratory. This type of shock is prevalent in many astrophysical systems and crucial to the formation of supernova remnants. I will very briefly touch on this topic, as it is a new direction for my research and opens many opportunities for further study.

My present and future research interests lie in the astrophysical analogs of the HED systems that we create in the lab using high-power lasers. The fundamental plasma science at the heart of this field is essential to understanding some of the most interesting phenomena in our universe. In this field of research, large-scale physics experiments are often executed at user-facilities in the US and abroad, while much of the diagnostic and technological development is done at the academic institution. My research is motivated by outstanding questions in astrophysics, but the technologies developed for this work are of great importance to the whole HED physics community. I will briefly cover upcoming experiments at the Jupiter Laser Facility that will lay the ground work for future studies of shock-processed dust-destruction rates in supernova remnants. I will also cover my plans to build a first-class facility at CU Boulder for training students in the rapidly growing field of HED Laboratory Astrophysics.

Wednesday, February 3rd @ 10am

CIPS Stern Conference Room, Gamow Tower F931

Refreshments 9:45 Room F935