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Experiments to study KH evolution of filaments feeding starburst galaxies on Omega-EP

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Galaxies need to accrete gas to form stars. Stars form near the center of the galactic halo within the galactic disc. The most proficient star forming galaxies, starburst galaxies, are those that involve filaments that withstand the shock that forms at the edge of the galactic halo and transport matter deep into the galactic disc [1][2][5]. The cold, dense matter within the filament moves within the hot gaseous background, indicating that the filament boundary is likely Kelvin-Helmholtz (KH) unstable. If the KH instability is allowed enough time to evolve, significant mixing will occur between the hot shocked background and colder dense material and will potentially disrupt the filaments before they can penetrate deeply within the galaxy. Galactic scale simulations capable of modeling the filament dynamics lack the spatial resolution to capture the hydrodynamics that are believed to occur on the filament interface. We have conducted a scaled [3] [4], high-energy-density laboratory experiment on the Omega-EP laser that emulates and studies the cosmological process of a cold stream penetrating a shocked region. We use a radiography diagnostic to observe the KH instability on the filament boundary and help tune hydrodynamic simulations performed using CRASH. From the data and tuned simulations, we determine how the KH instability reduces the areal mass flux of the shocked filament. Finally, we examine the extent to which the KH instability can inhibit mass delivery to the galactic disc.
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