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Heat Transport in the Precursor of Carbon and Metallic Wire Arrays JACK HARE, SERGEY LEBEDEV, MATTHEW BENNETT, SIMON BLAND, GUY BURDIAK, LEE SUTTLE, FRANCISCO SUZUKI-VIDAL, GEORGE SWADLING, Imperial College, ALEXANDER VELIKOVICH, Naval Research Laboratory — The complex interplay between the transport of heat and magnetic fields in high-β, magnetised plasmas is crucial to the feasibility of Magnetised Liner Inertial Fusion (MagLIF). We consider using the precursor plasma in a cylindrical wire array to reach the relevant dimensionless parameters for the initial state of the MagLIF plasma. The precursor is a hot, dense, stable plasma formed on the axis by the collision of material ablated from the wires. Simple models show that an axial magnetic field of ≈ 5 T could magnetise the precursor ($\omega_e \tau_e \approx 10$) at high-beta ($\beta \approx 10$). In this regime, the Nernst term may dominate the transport of the magnetic field, affecting the heat transport. The experiments are conducted on MAGPIE (1.4 MA, 250 ns rise time). Metallic wire arrays are standard, but to reduce radiative losses and the electron-ion thermalisation time, we will also consider carbon in the form of 0.3 mm diameter graphite rods. The axial magnetic field can either be provided by external coils or by the drive current. We study the evolution of the plasma density and temperature using laser interferometry and Schlieren imaging, an optical streak camera and Thomson scattering. The magnetic field can be studied using fibre-based polarimetry.

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