Magnetised Transport and Laser Propagation in Plasmas in 3D

Henry WATKINS [1], Robert KINGHAM [1]

1) Blackett Laboratory, Imperial College London

E-mail: h.watkins15@imperial.ac.uk

Inertial fusion schemes use high-power lasers to supply energy to a hohlraum or fusion fuel to either shock compress a plasma or pre-heat the fuel with the aim of reaching the densities and temperatures required for fusion to occur. These methods require the laser energy deposition to be as uniform and concentrated as possible to ensure high temperatures. In a magnetised plasma the transport of heat across magnetic field lines can be restricted by collisional effects [1] and this mechanism has been suggested as a means to ensure greater deposition of laser energy into the hohlraum [2] or directly into fusion fuel.

Building on previous 2D laser propagation work [3], a new full Braginskii [1] magnetised transport plasma physics code PARAMAGNET has been written. It includes a paraxial laser solver to model laser propagation and enables us to model the effects of magnetic fields on laser plasma heating, propagation and uniformity in experiments relevant to nuclear fusion. The three dimensional nature of the code allows the investigation of arbitrary magnetic fields in complex magnetic geometries generated through laser-plasma interactions and under applied fields.

We will present progress on investigations on the effect of magnetic fields and magnetised transport on the filamentation and propagation of laser light in three dimensions in fusion relevant plasmas with the aim of improving laser energy deposition and improving basic understanding of laser-plasma interactions under a magnetic field.

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References

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