Magnetised Thermal Filamentation and Self-Focussing Laser-Plasmas

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The use of magnetic fields in Inertial Confinement Fusion (ICF) experiment[1,2] requires the introduction of the Braginskii magnetised anisotropic transport coefficients[3]. We study the effect of the magnetised thermal conductivity on the propagation of a long-pulse laser in the underdense plasma regime relevant to ICF parameters. An analytic model is derived for the laser self-focussing and shows the shortening of the self-focal length of a laser beam in a plasma because of the magnetised reduction of the plasma thermal conductivity. Furthermore the thermal mechanism filamentation[4,5] of a laser under a magnetised plasma has an increased spatial growth rate. These analytic results are compared with the PARAMAGNET laser-plasma code and found to be in good agreement. We discuss the effect of these results on recent magnetised inertial fusion experiments where filamentation can be detrimental to laser propagation and uniform laser heating. The application of external magnetic fields to laser-plasma experiments requires the inclusion of the extended electron transport terms in simulation[6].

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