

Strong suppression of heat conduction in a laboratory replica of galaxy-cluster turbulent plasmas

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There are a number of possible mechanisms that can lead to a reduction from the classical (local) Spitzer conductivity. For these processes to occur, the electron's Larmor radius must be small compared to its Coulomb mean free path, enabling microscale changes in the electron heat transport to alter the global properties of the plasma dynamics. As numerical simulations are unable to address these issues fully, we have performed experiments using the National Ignition Facility laser at the Lawrence Livermore National Laboratory to create a weakly-collisional plasma with stochastic magnetic fields.

Our data shows a prominent reduction of local heat transport by orders of magnitude, leading to strong temperature variations on small spatial scales. These results are important for the understanding of energy balance in astrophysical plasmas as well as in inertial confinement fusion experiment

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