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The effect of magnetic fields and ablative stabilization on Rayleigh-Taylor unstable inertial confinement fusion plasmas BHUVANA SRINIVASAN, XIAN-ZHU TANG, Los Alamos National Laboratory — It has long been expected that Rayleigh-Taylor instabilities (RTI) in inertial confinement fusion (ICF) can generate magnetic fields at the gas-ice interface and at the ice-ablator interface during the deceleration phase of target implosion. The focus here is on the gas-ice interface where the temperature gradient is the largest. Nonlinear evolution of RTI leads to undesirable mixing of hot and cold plasmas and enhances target energy loss. RTI is also expected to generate magnetic fields via the Biermann battery effect which mitigate energy loss by decreasing electron thermal conduction at the gas-ice interface. The Hall-magnetohydrodynamics model is used to self-consistently study the generation and growth of magnetic fields in RTI. Externally applied magnetic fields grow due to the MHD dynamo and can result in mix mitigation in addition to significant electron thermal conductivity mitigation. Electron thermal conductivity can cause ablation of the ice into the gas, leading to ablative stabilization of RTI. Mitigation of electron thermal conductivity (and energy loss) in the presence of magnetic fields has a conflicting effect with the ablative stabilization of RTI brought about due to electron thermal conductivity. A study of this conflicting effect will be presented.

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