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Simulations of self-generated magnetic fields in inertial confinement fusion implosions[1] PO-YU CHANG, RICCARDO BETTI, ORLIN GOTCHEV , Fusion Science Center and Laboratory for Laser Energetics, MIFEDS TEAM — Magnetic fields in laser produced plasmas can be self-generated by the so-called $\nabla n \times \nabla T$ effect and resistive electric fields associated with a neutralizing return current. The $\nabla n \times \nabla T$ fields can be induced by the fluid vorticity originating at the ablation front and amplified by the Rayleigh-Taylor (RT) instability. They can also be driven by the diamagnetic heat flux that leads to the thermo-magnetic (TM) instability. We present the results of simplified two-dimensional simulations of the $\nabla n \times \nabla T$ magnetic fields driven by the RT and TM instabilities. We show that the RT-induced B-fields reach megagauss (MG) levels only for short wavelength modes in cryogenic DT ablators. We also show that the Nernst effect causes these fields to be localized near the ablation surface. The magnetic fields driven by the TM instability grow on a time scale of hundreds of picoseconds and can further amplify the RT-produced fields in the coronal plasma. These results are compared with the recent experimental measurements of self-generated B-field in ICF implosions.

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