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The growth and saturation of the two-plasmon decay instability in inertial confinement fusion[1] R. YAN, A. MAXIMOV, C. REN, University of Rochester, F. TSUNG, UCLA — We present particle-in-cell (PIC) and fluid simulations on the two-plasmon-decay (TPD) instability under conditions relevant to direct-drive inertial confinement fusion experiments. The PIC simulations show a wide TPD spectrum, with modes whose perpendicular mode number $k_\perp$ larger than the cutoff predicted by the linear theory for absolute modes. The fluid simulations, solving the full set of the linear equations of TPD, show that large-$k_\perp$ modes are convective and have linear growth rates comparable to the absolute modes. The convective modes grow at the lower density region and can cause pump depletion, reducing the growth of the absolute modes. The convective modes, saturating before reaching the convective limit, are energetically dominant in the nonlinear stage. The PIC simulations show that both the absolute and convective modes saturate due to ion density fluctuations. The results show that the convective modes of TPD are important to the performance of current and future direct-drive experiments.

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