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Two-plasmon decay instabilities in a plasma with ion density fluctuations JUN LI, CHUANG REN, RUI YAN, Laboratory for Laser Energetics, University of Rochester — Previous study found that the two-plasmon decay (TPD) modes in the low density region were important to hot electron generation in direct-drive inertial confinement fusion [R. Yan et al, Phys.Rev.Lett 108, 175002 (2012)]. These modes were linked to ion density fluctuations and formed the first stage for electron acceleration due to their low phase velocities. Here we investigate the excitation mechanism of these modes by studying linear growth of TPD instabilities in a plasma with ion density modulations under parameters relevant to OMEGA experiments using LTS [R. Yan et al, Phys.Plasmas 17, 052701 (2010)] fluid simulations. It is found that when a sinusoidal static ion density modulation is added to the linear plasma density profile, the otherwise convective TPD modes become absolute with a growth rate depending on the modulation amplitude and wave number. The maximum absolute growth rate is $\sim 70\%$ of the corresponding homogeneous TPD growth rate, much higher than the convective growth rate without the ion density modulation. An analytical theory is also developed to understand these results. This may explain why in Particle-in-Cell simulations these modes were only found in the nonlinear stage when ion density fluctuations were present.

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