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Experiments on the scaling of growth and saturation of two-plasmon decay with plasma conditions[1] J.R. FEIN, J.P. HOLLOWAY, U. of Michigan, D.H. EDGELL, D.H. FROULA, D. HABERBERGER, Laboratory for Laser Energetics, U. of Rochester, P.A. KEITER, U. of Michigan, J.F. MYATT, Laboratory for Laser Energetics, U. of Rochester, M.R. TRANTHAM, R.P. DRAKE, U. of Michigan — In inertial confinement fusion (ICF), multiple overlapping lasers interact with under-dense plasma to drive the two-plasmon decay (TPD) instability. The resulting plasma waves can produce hot electrons that preheat the ICF capsule fuel and reduce compression efficiency. Preliminary experiments have demonstrated that TPD can be controlled through varying electron density scale-length and temperature by increasing plasma Z.[2] Additionally, simulations have indicated that TPD may saturate by nonlinear processes that depend on plasma Z through the ion-acoustic wave damping rate.[3] We have performed experiments on OMEGA EP to thoroughly study the dependence of TPD on plasma conditions, through varying target material over a wide range of Z. Hot electron energy is observed to decrease as plasma Z increases, in a manner that is consistent with the shortening electron density scale-lengths that were measured. Finally, we present a scaling of total hot electron energy with the TPD linear gain parameter to identify whether the instability has nonlinearly saturated.

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[2]Hu, S.X., et al. POP, 20(3), (2013).
[3]Myatt, J.F., et al., POP, 20(5), (2013).

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