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Laser hosing in relativistically hot plasmas C. REN, G. LI, University of Rochester, W.B. MORI, UCLA — Electron response in an intense laser is studied in the regime where the electron temperature is relativistic, which is recently accessible in laboratory with kJ-class, short-pulse lasers. Equations for laser envelope and plasma density evolution, both in the electron plasma wave and ion acoustic wave regimes, are re-derived from the relativistic Vlasov equation to include the plasma temperature effect. They show that the mass of an electron fluid element increases relativistically from its thermal energy as well as its fluid motion. These equations are used to study short-pulse and long-pulse laser hosing instabilities using a variational method approach. The analysis shows that relativistic electron temperatures reduce the hosing growth rates and shift the fastest-growing modes to longer wavelengths. These results resolve a long-standing discrepancy between previous non-relativistic theory and simulations/experiments on hosing. This work was supported by DOE under Grant DE-FG02-06ER54879 and Cooperate Agreement No. DE-FC52-08NA28302, by NSF under Grant PHY-0903797, and by NSFC under Grant No. 11129503. The research used resources of NERSC.

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