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Impact of Non-Maxwellian Electron Distribution Functions on Crossed-Beam Energy Transfer[1]

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Energy transfer between crossed laser beams is an important process in both the direct- and indirect-drive approaches to inertial confinement fusion (ICF), and unreliable predictions in numerous contexts have raised questions as to the validity of models. Typically, those models require state variable inputs (i.e., n_e, T_e, and T_i) that are computed in radiation-hydrodynamic simulations, which assume Maxwellian electron distribution functions (EDF). However, laser plasma heating is predicted to distort the EDF away from Maxwellian[2]. Here, measurements of the complete Thomson scattering spectrum indicate the presence of super-Gaussian EDF's that are consistent with existing theory[3]. In such plasmas, ion acoustic wave (IAW) frequencies increase monotonically with super-Gaussian exponent[4]. To match experiments that measured power transfer between crossed laser beams mediated by IAW's, accounting for the measured non-Maxwellian EDF is required[5]. This effect is estimated to decrease energy transfer in indirectly-driven hohlraums at the National Ignition Facility by $\approx 27\%$; this will reduce (and may eliminate) the *ad hoc* saturation clamp that has previously been used to match observables like shape, thereby improving the predictive capability of integrated modeling.

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