Cross-beam energy transfer (CBET) in ICF : the effect of laser speckles in presence of ponderomotive self-focusing

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Both in the direct- and the indirect drive scheme for Intertial Confinement Fusions (ICF) Crossed beam Energy Transfer (CBET) between laser beams is still a major issue. Part of this problem is the complexity of the process involving both the plasma hydrodynamics and its interaction with the numerous incident laser beams.

We model CBET by taking into account the speckle (hot spot) substructure of "smoothed" laser beams that has been disregarded in most of the previous studies. By means of numerical simulations with a wave coupling model [1], it can be shown that transfer from laser hot spots of one beam to the another beam, via self-focusing in presence of plasma flow [2,3] and "beam bending"[4,5], proves to affect considerably the angular spread of the light behind the region of beam overlap for laser intensities $I\lambda^2 > 10^{14}$ W cm^{-2} μm^2 . For this reason the angular distribution of transmitted light from smoothed laser beams (with speckles) is very different from the angular distribution of beam when the beam speckle structure is disregarded. We also show the importance of non-linear, shock-like structures of ion waves and of the so-called plasma-induced smoothing to CBET.

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