Predicting the growth of backward stimulated Brillouin scattering of smoothed laser beams

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Based on a previous work [1], we derive a system of equations describing the backward stimulated Brillouin scattering (BSBS) in the convective regime. This new model accounts for the polarization, temporal and spatial beam smoothing techniques used in most high energy laser facilities [2]. Quantifying the instability variability induced by the phase plates is shown to be crucial for understanding quantitatively the backscattering spatial growth as well as the reflectivity. An analytical correction to the plane wave spatial gain is extracted from our theory for a simple and effective reflectivity prediction that includes the impact of the most relevant smoothing techniques in inertial confinement fusion (ICF) conditions. Validated by a large number of three dimensional hydrodynamic paraxial (Hera) simulations [3] and experimental data [4], our model shades a new light on the long-time studied BSBS deleterious to many high energy experimental studies related to the physics of ICF [5].

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