

## **Recent advances in the modeling of stimulated Raman scattering**

D. Bénisti

*CEA, DAM, DIF 91297 Arpajon Cedex, France*

In this talk, we first present a quick overview of the recent theoretical results obtained, both, in nonlinear wave-particle interaction and in the use nonlocal variational principles to describe wave propagation. As an application, we show how to solve theoretically for the nonlinear growth and saturation of the cold-beam plasma instability, and we introduce a set of coupled envelope equations that the model stimulated Raman scattering. These equations account for nonlinear kinetic effects, plasma inhomogeneity and non stationarity in a three-dimensional geometry, and interspeckle coupling. They proved to provide accurate results as regards Raman reflectivity in the nonlinear kinetic regime, within computation times reduced by about five orders of magnitude compared to a Particle-In-Cell code.

In spite of their accuracy and effectiveness, the envelope equations cannot be solved directly in the hydrodynamical codes used for inertial confinement fusion. Consequently, one needs to introduce simplified models, and such a model, that accounts for nonlinear kinetics effects, is introduced. Comparaisons between the results obtained with this model and the complete set of equations are given, and the interplay between both approaches is discussed.