Self-focusing induced reduction of Stimulated Brillouin Scattering for the case of monospeckle laser beams interacting with a plasma

PAUL-EDOUARD MASSON-LABORDE, CEA-DIF, F-91297 Arpajon, France, STEFAN HUELLER, DENIS PESME, Centre de Physique Theorique, CNRS UMR 7644, Ecole Polytechnique, 91128 Palaiseau, France, PASCAL LOISEAU, CEA-DIF, F-91297 Arpajon, France, CHRISTINE LABAUNE, HEIDI BANDULET, LULI, CNRS UMR 7605, Univ. Pierre et Marie Curie, Ecole Polytechnique, 91128 Palaiseau, France — The mechanism explaining the low level of Stimulated Brillouin Scattering observed in laser-plasma experiments with monospeckle laser beams, carried out at the LULI facility, is studied by means of numerical simulations. For the regime where the beam power is well above the self-focusing critical power, simulations carried out with the codes Harmony2D and HERA-ILP (in 2D and 3D geometry respectively), show time-averaged reflectivities of the order of only a few percent. Because of self-focusing and the filament resonant instability, SBS takes only place in self-focused hot spots located in the low-density front part of the plasma. The shortened hot spot sizes and the steepened flow-profile dramatically reduce SBS. This scenario may also applies to the most intense laser hot spots in a spatially smoothed laser beam.

Paul-Edouard Masson-Laborde
CEA-DIF, F-91297 Arpajon, France

Date submitted: 18 Jul 2008