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Synchronization and Competition in a Double-Bump-on-Tail Instability DMITRY V. DYLOV, JASON W. FLEISCHER, Princeton University, Princeton, NJ 08544, USA — We experimentally and theoretically consider a double-bump-on-tail instability by mapping the general wave-kinetic problem to a multiple beam propagation problem using statistical light. More specifically, we consider the nonlinear interaction of three spatially-incoherent beams in a self-focusing photorefractive crystal. For weak nonlinearity, we observe instability competition and sequential flattening of the bumps in momentum space, with no observable variations in position-space intensity. This joint dynamics resembles the phase synchronization of a "classical" laser system (relaxation from a "non- equilibrium" state to a lower-energy one), with the corresponding gain rates following from the optical equivalent of inverse Landau damping. For strong nonlinearity, intensity modulations appear and the triple-hump spectrum merges into a single-peaked profile with an algebraic k^{-2} inertial range. This spectrum, with its associated modulations, is a definitive observation of soliton, or Langmuir, turbulence.

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