Quantum fluids of light with hot atomic vapors

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A hot vapor of Rubidium atoms is a efficient platform to simulate an 2D non linear Schrödinger equation if sufficient non linearity is achieved. We have used this system to study the onset of classical wave condensation and observed a rapid increase of a precondensed fraction [1], where the thermal initial distribution is realized by a wavefront passed through a small angle diffuser. The evolution of the speckle like intensity distributio in near field reveals the fast precondensation of classical waves. The versatility of this platform allows to study a large variety of non linear wave physics. We have studied the formation of shock waves using a gaussian beam on top of a large background beam, similar to a bright soliton initial condition. Using a dark soliton like initial condition, we have observed snake instabilities and the spontaneous formation of vortices. The experimental results are well described by numerical simulations when a surprisingly large non locality is included.

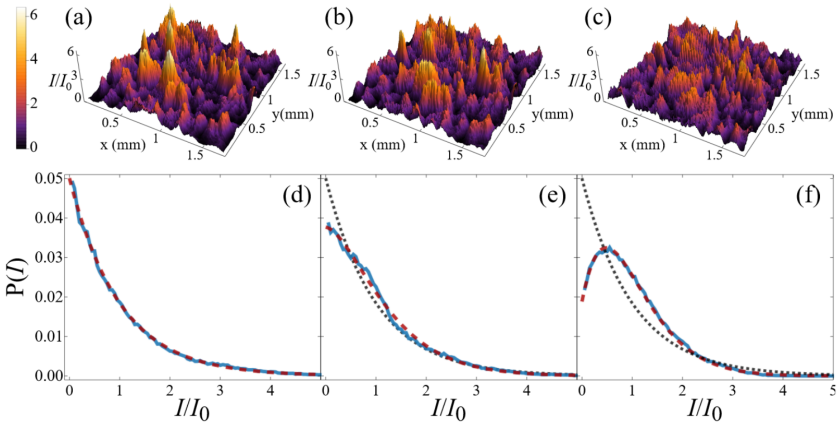

Figure 1. Near Field Speckle for increasing non linearities :(a)-(c) near field images for L/z_{NL}= 0, 3.5π and 14.4π; (d)-(f): corresponding intensityhistograms, showing the emergence of a non zero value for themaximum of $P(I)$.

[1] N. Santic, A. Fusaro, S. Salem, J. Garnier, A. Picozzi, R. Kaiser, Phys. Rev. Lett. 120, 055301 (2018).