Two-component fluids of light in a hot Rubidium vapor

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Quantum fluids of light are based on the mathematical analogy between the Gross-Pitaevskii equation (GPE), which describes Bose-Einstein condensates, and the propagation of a laser through a nonlinear Kerr medium – in our case a Rubidium vapor. This work focuses on how this analogy can be pushed to the realization of a two-component fluid. The two-component GPE naturally arises when considering the propagation of the field's circular polarization components. We can then define intra- and inter-component interaction terms, of which the signs and relative weights determine whether the mixture is stable or unstable, miscible or immiscible.
I will present different measurements to establish which regimes can be achieved in our system.
In particular, I will show experimental results on the density and spin dispersion measurements in the miscible regime, where we also use the saturation of the medium to transition between effective attractive and repulsive inter-component interactions.