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Self-Consistent Spin Texture in a Quantum Gas through Opto-Magnetic Effects KATRIN KROEGER, NISHANT DOGRA, Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland, MANUELE LANDINI, University of Innsbruck, 6020 Innsbruck, Austria, LORENZ HRUBY, FRANCESCO FERRI, RODRIGO ROSA-MEDINA, TOBIAS DONNER, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland — Placing a multilevel atomic Bose-Einstein-Condensate inside a high finesse optical cavity allows to explore various scenarios of light-matter interaction. In this work, we investigate the influence of opto-magnetic effects on the self-organization phase transition [M. Landini et al., PRL 120, 223602 (2018)]. Controlling the polarization of an off-resonant transverse pump laser field allows to identify the roles of the scalar and the vectorial components of the atomic polarizability tensor. For a multicomponent condensate, we observe a competition between self-organization patterns modulating either density or magnetization. Beyond a critical ratio of vectorial over scalar coupling, a spin texture is created. We develop an extension of the Dicke model and find excellent agreement with the experimental data. Our findings demonstrate a direct competition between self-organization patterns in a single mode optical cavity, paving the way to the exploitation of opto-magnetic effects for quantum simulation.

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