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Formation of a spin texture in a quantum gas coupled to a cavity LORENZ HRUBY, MANUELE LANDINI, NISHANT DOGRA, KATRIN KROEGER, TOBIAS DONNER, TILMAN ESSLINGER, ETHZ — We experimentally study the self-organization of single and multi-component 87Rb Bose-Einstein condensates, strongly coupled to a single-mode optical cavity and subject to an off-resonant pump field, propagating transversely to the cavity axis. We identify the roles of the scalar and the vectorial components of the atomic polarizability tensor for the atom-light coupling using a driving field of adjustable linear polarization. When prepared in only one of the Zeeman-split magnetic sublevels of the F=1 manifold, the atomic cloud undergoes a Dicke-type phase transition into a density-modulated state. We study as a function of the different polarization angles of the pump laser with respect to the cavity axis the dependency of the phase transition threshold and the relative phase between the pump and cavity field for the three magnetic sublevels. In both cases we find good agreement with our theoretical analysis. Preparing the condensate in a balanced mixture of the mF=+1 and mF =-1 sublevels, we observe a magnetically ordered state below a critical angle of the pump polarization. The observed spin textures originate in a cavity mediated spin-dependent interaction between the atoms.

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