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Optical Information and Light-Matter Interactions in a Bose-Einstein condensate L. SUZANNE LESLIE, AZURE HANSEN, JUSTIN T. SCHULTZ, NICHOLAS P. BIGELOW, University of Rochester — Information can be coherently transferred between light and matter. Our approach uses a two-photon Raman interaction in a lambda configuration to encode the difference in the electric fields into the spinor wavefunction of a Bose-Einstein condensate (BEC). This process simultaneously transfers population between the initial and final states of the lambda system, and creates a coherence between the populated states. By choosing a defocused Gaussian and a tightly-focused Laguerre-Gaussian (LG) beam for the Raman beam pair, the doughnut intensity profile and the azimuthal phase winding of the LG beam can be written into the condensate and stored as a spin texture called a coreless vortex. We use density matrices to model this interaction in all three spatial dimensions as well as time.

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