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Gauge potentials and relativistic effects for stationary-light polaritons JOHANNES OTTERBACH, RAZMIK UNANYAN, University of Kaiserslautern, JULIUS RUSECKAS, GEDIMINAS JUZELIUNAS, ITPA, Vilnius University, MICHAEL FLEISCHHAUER, University of Kaiserslautern — We discuss dynamic phenomena of light-matter quasi particles arising in the Raman interaction of a weak light field with a coherently driven atomic ensemble. These so called dark-state polaritons (DSP) posses an externally controllable mass and are the basis of phenomena such as slow and stationary light. First we discuss the case of stationary light at very short length scales. The dynamics is then governed by an effective Dirac equation. This behavior sets the limit for the compression of stationary light in such setups. We discuss relativistic effects, as e.g. Klein tunneling and Zitterbewegung, that can be observed in the system at hand. Second we present a setup to create effective magnetic fields for DSPs. At large pulse lengths DSPs behave as Schrödinger particles and a confinement to lower dimensions is easily done. These effective fields can be used to study a variety of single- and many-particle effects as e.g. Lorentz forces for neutral particles and the fractional quantum Hall effect (FQHE).

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