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Two-dimensional 'photon fluid': Effective photon-photon interaction and physical realizations SUSANNE VIEFERS, JON MAGNE LEINAAS, Oslo University, THORS HANS HANSSON, Stockholm University, RAYMOND CHIAO, UC Berkeley — We describe a recently developed effective theory for atom-mediated photon-photon interactions in a two-dimensional "photon fluid" confined to a Fabry-Perot resonator. The photons in the lowest longitudinal cavity mode will appear as massive bosons interacting via a renormalized delta-function potential with a strength determined by physical parameters such as the density of atoms and the detuning of the photons relative to the resonance frequency of the atoms. We discuss novel quantum phenomena for photons, such as Bose-Einstein condensation and bound state formation, as well as possible experimental scenarios based on Rydberg atoms in a microwave cavity, or alkali atoms in an optical cavity.

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