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A novel experiment for coupling a Bose-Einstein condensate with two crossed cavity modes TOBIAS DONNER, JULIAN LEONARD, MOOJNOO LEE, ANDREA MORALES, THOMAS KARG, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich — Over the last decade, combining cavity quantum electrodynamics and quantum gases allowed to explore the coupling of quantized light fields to coherent matter waves, leading e.g. to new optomechanical phenomena and the realization of quantum phase transitions. Triggered by the interest to study setups with more complex cavity geometries, we built a novel, highly flexible experimental system for coupling a Bose-Einstein condensate (BEC) with optical cavities, which allows to switch the cavity setups by means of an interchangeable science platform. The BEC is generated from a cloud of laser-cooled 87-Rb atoms which is first loaded into a hybrid trap, formed by a combined magnetic and optical potential, and then optically transported into the cavity setup, where it is cooled down to quantum degeneracy. At first we aim to explore the coupling of a BEC with two crossed cavity modes. We report on our progress on the implementation of a science setup involving two cavities intersecting under an angle of 60°. his setup will allow us to study the coherent interaction of a BEC and the two cavity modes both in internal lambda-level transitions and in spatial self-organization processes in dynamical hexagonal lattices.

Tobias Donner
Institute for Quantum Electronics, ETH Zurich

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