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Crossover between a laser-like state and a photon Bose-Einstein condensate MARTIN WEITZ, JULIAN SCHMITT, TOBIAS DAMM, FRANK VEWINGER, JAN KLAERS, University of Bonn — Bose-Einstein condensation has been observed with cold atomic gases, quasiparticles in solid state systems as polaritons, and more recently also with photons in a dye-filled microcavity. Here we examine in detail the thermalization dynamics of the photon gas in the dye-filled microcavity system, which proceeds by absorption and re-emission processes to the rovibrational temperature of the dye molecules. We use pulsed excitation of the dye-filled microcavity. When the thermalization by absorption and emission is faster than the photon loss rate in the cavity, the photons accumulate at lower energy states above the cavity low-frequency cutoff, and the system finally thermalizes to a Bose-Einstein condensate of photons. On the other hand, for a small reabsorption with respect to the photon loss, the state remains laser-like. We observe a crossover between a laser-like state and a photon condensate, which can be controlled by adjusting the ratio of the dye reabsorption versus the cavity loss rate.

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