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Preparation and measurement of strongly interacting states of photons

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Photons has been considered as a promising medium to implement quantum simulators. However, most phenomena that are interesting from quantum simulation perspective involve thermalization and a controllable chemical potential, as a key parameter in phase diagrams, which are both absent for photons. More specifically, on the one hand, photonic systems are dissipative which means that the chemical potential is zero, and on the other hand, due to the weakness of inelastic scatterings, photons do not naturally thermalize. I will discuss various externally driven schemes to prepare manybody states of photons in the presence of dissipation. In fact, such driven-dissipative nature of these systems is the crucial reason of their interest. Specifically, I investigate driven fractional quantum Hall and Bose-Hubbard models. Furthermore, I describe how to characterize and measure various manybody features of correlated states of photons.