Strongly correlated polaritons in coupled cavities

D. Rossini

Scuola Normale Superiore, Piazza dei Cavalieri 7, 56126 Pisa, Italy

Arrays of coupled QED cavities are promising candidates to study many-body states of light in a controlled way. The rich scenario which emerges in these systems stems from the interplay between light-matter interaction inside each cavity, generating a Kerr non-linearity between photons, and photon hopping between cavities. This leads to an effective Bose-Hubbard model of polaritons (see, e.g., the reviews [1]-[3]).

Thanks to the flexibility in the design of the coupling elements, finite-range couplings between cavities can also appear in the form of cross-Kerr non-linearities and/or as a correlated photon hopping, thus producing an even richer steady-state phase diagram.

We discuss in particular the appearance of a photonic crystal associated with a periodic modulation of the photon blockade, when the array is driven by a coherent homogeneous pump. In some cases, such crystalline order may coexist with phase synchronization [4].

References

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*corresponding author: rossini@sns.it