

## ”Disorder-protection” in many-body cavity-QED

*Monday 2 October 2023 16:40 (40 minutes)*

Theoretically explaining experimental observations of cavity-modified physics and chemistry remains to be a major challenge, in particular for a large number of coupled emitters ( $N$ ). Here I discuss a bottom-up approach with minimal quantum many-body models, which include electronic, photonic, and motional degrees of freedom in their simplest form. Solving these (already complex) many-body models for large  $N$  with advanced numerical methods allows us to gain insight on fundamental physical processes.

In this talk I discuss how disorder in cavity-QED models can lead to exotic localization features. In particular, I introduce how dark states acquire a “semilocalized” nature with unusual properties in terms of level statistics and other localization quantifiers. I then discuss how such states can play a crucial role for energy transport and cavity-modified vibrational dynamics. As a main conclusion, our work shows that disorder and semilocalized states can make cavity-effects more robust in a large- $N$  limit, where individual emitter cavity-coupling strengths are small.

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**Session Classification:** Afternoon session