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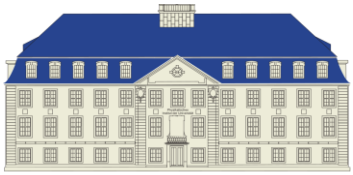

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COLLOQUIUM „OPTICS AND CONDENSED MATTER“

Martin Eckstein

Friedrich-Alexander-University Erlangen-Nürnberg, Germany

Can we manipulate quantum materials via strong light-matter coupling in cavities?

Enhancing the light-matter coupling in cavities provides an intriguing route to control properties of matter, from chemical reactions to transport and thermodynamic phase transitions. Order parameters which couple linearly to the electromagnetic field, such as ferroelectricity, incommensurate charge density waves, or exciton condensates, appear most suitable in this context, but the possible mechanisms are not well understood in many cases. In this talk, I will discuss possibilities to manipulate interactions and band structures in a solid via the quantum fluctuations of the electromagnetic field; these results generalize the well-established Floquet engineering of correlated electrons to the regime of quantum light [1]. Specifically, this will be discussed for a model with competing superconductivity and charge density wave order [2]. Finally, we discuss a more phenomenological approach, which allows to generally relate the response of a material under strong light-matter coupling in a single mode cavity to its nonlinear response "outside the cavity" [3].

[1] M. A. Sentef, J. Li, F. Künzel, and M. Eckstein, Phys. Rev. Research 2, 033033 (2020).
[2] J. Li and M. Eckstein, Phys. Rev. Lett. 125, 217402 (2020).
[3] K. Lenk, J. Li, Ph. Werner, M. Eckstein arXiv:2205.05559.

May 24th, starting with discussion at 16:45 h, talk at 17:15 h, live IAP lecture hall and via Zoom
https://uni-bonn.zoom.us/j/98441612025?pwd=a01SSjlkY1Q3SDFhL09JQk1qc1V6dz09
Meeting-ID: 984 4161 2025
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