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**Hybrid qubit-resonator systems: From strong to ultra-strong coupling, from equilibrium to non equilibrium phases**  
DAVID ZUECO, THOMAS HÜMMER, MARK JENKINS, MARÍA JOSÉ MARTÍNEZ-PÉREZ, Universidad de Zaragoza - ICMA, GEORG REUTHER, Universitat Augsburg, JUAN JOSÉ GARCÍA-RIPOLL, CSIC, FERNANDO LUIS, Universidad de Zaragoza - ICMA, PETER HÄNGGI, Universitat Augsburg — Hybrid systems : spin ensembles coupled to superconducting circuits have received a lot of attention recently. In a seminal experiment it has been demonstrated strong coupling between a NV-center spins ensemble and a flux qubit. The ensemble maps to a bosonic mode, thus this setup is a realization of a qubit-resonator model. In this talk we propose molecular magnets, instead of NV centers, as ensembles and we show that with them it is possible to reach the ultra strong coupling (the coupling is around 40% of the qubit-resonator frequencies). Finally, we emphasize the potentiality of these architectures for exploring many body physics by building arrays made of flux qubits and crystal spins. We will discuss non equilibrium signatures of Mott insulator - Superfluid phases and its feasibility within current technology.

Prefer Oral Session  
 Prefer Poster Session

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