Spécialité de M2 : Concepts Fondamentaux de la Physique
Ecole Doctorale de Physique de la Région Parisienne (ED107)

PROPOSITION DE SUJET DE STAGE DE M2 ET/OU DE THESE

Nom Laboratoire : CPHT Ecole Polytechnique
Code d'identification CNRS : UMR7644
Nom du responsable du stage ou thèse : Karyn Le Hur
e-mail : karyn.lehur@cpht.polytechnique.fr
téléphone : 01 69 33 42 67
page web: http://www.cpht.polytechnique.fr/spip.php?article501&lang=en
http://www.yale.edu/lehurgroup/
Lieu du stage: Ecole Polytechnique
Stage pouvant déboucher sur une thèse : OUI
Financement proposé : NON

Quantum Electrodynamics Networks: Non-Equilibrium Condensed-Matter Physics with Light

Systems of ultracold atoms in optical lattices (networks) are very appealing to condensed matter physicists: they are tunable and provide a versatile quantum simulator. Recently, it has also been realized that quantum *networks* in cQED (circuit Quantum Electrodynamics) may also realize exotic quantum phase transitions and novel non-equilibrium quantum dynamics of light. For recent reviews on these modern networks, see, Nature Physics and Reviews Insight on Quantum Simulation, April 2012. Because dynamics and correlations can now be investigated quantitatively, relevant questions are also emerging in these artificial quantum networks, in many cases demanding deeper theoretical understanding and new methods of solution. In this project, the goal is to develop a theoretical framework to investigate the propagation of microwave photons in QED networks under non-equilibrium conditions [1,2]. Interactions can be mediated from the light-(artificial) atom interaction or through nonlinear cavities. Studying the quantum dynamics of light in these networks and including dissipation effects from the external environment (bosonic or fermonic) is an interesting and open question. Other experimental relevant realizations can be found in Refs. [3].

Keywords: condensed-matter; quantum optics; many-body dynamics

[1] **Book on Understanding Quantum Phase Transitions, editor L. D. Carr Taylor and Francis, Boca Raton, 2010, Chapter on Quantum Phase Transitions in Spin-Boson Systems: Dissipation and Light phenomena, by Karyn Le Hur (also accessible at arXiv:09094822)**
[2] Karyn Le Hur, Phys. Rev. B 85, 140506(R) (2012); Peter P. Orth, Adilet Imambekov and Karyn Le Hur, Phys. Rev. A 032118 (2010)
[3] M. R. Delbecq et al. Phys. Rev. Lett. 107, 256804 (2011); Max Hofheinz et al, arXiv:1102.0131

http://www.cpht.polytechnique.fr/spip.php?article501&lang=en
http://www.yale.edu/lehurgroup/
Indiquez le ou les parcours (ex DEA) qui vous semblent les plus adaptés au sujet :
Physique de la matière condensée : OUI Physique des Liquides: NON
Physique Quantique: OUI Physique Théorique: OUI