

Proposition d'un Projet de Recherche en Laboratoire

Titre : topological Materials, Quantum Dynamo Effect and Energy Applications

Laboratoire d'accueil : CPHT

Résumé : We have recently introduced a novel platform through spins-1/2 on a Bloch sphere [1] allowing us to address novel topological properties in quantum physics, condensed-matter systems and light-matter phenomena. Coupling to a cavity mode, this allows us to realize a *topological quantum dynamo effect* [2,3]: when rolling a spin from north to south we can produce light quanta in a topologically protected manner. This also raises new questions in 'quantum thermodynamics' and energy. We propose to generalize this approach for multiple spins coupling to a cavity mode [4] or to a dissipative bath, and also to link with applications in photovoltaic effects in quantum materials.

Motivated students can write to me at Karyn.le-hur@polytechnique.edu

Some References:

[1] J. Hutchinson and K. Le Hur, Communications Physics 4, 144 (2021)

<https://www.nature.com/articles/s42005-021-00641-0>

[2] L. Henriët, A. Sclocchi, P. P. Orth, K. Le Hur Phys. Rev. B 95, 054307 (2017)

[3] E. Bernhardt, C. Elouard, K. Le Hur, Phys. Rev. A 107, 022219 (2023)

[4] Review: K. Le Hur, L. Henriët, A. Petrescu, K. Plekhanov, G. Roux, M. Schiró,

<https://comptes-rendus.academie-sciences.fr/physique/item/10.1016/j.crhy.2016.05.003.pdf>

C. R. Physique 17 (2016) 808–835

Mots clés :

Nature : (Expérimental, théorique, numérique)

Accueil d'un binôme possible : Oui/Non

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