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| **Title** : **Correlated quantum matter and quantum information** | | |
| **First Name** : Laurent | **Name** : Sanchez-Palencia | **Laboratory** : CPHT |
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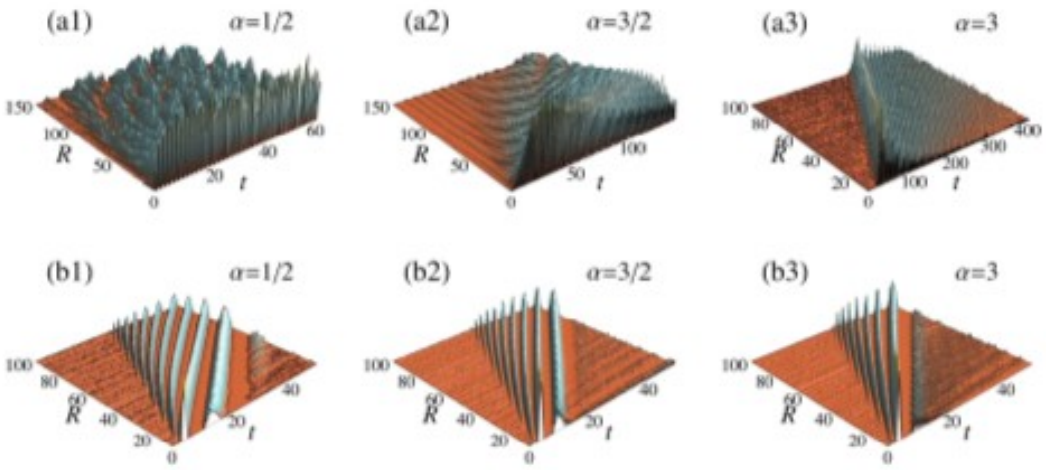
| **Webpage** : https://www.cpht.polytechnique.fr/cpht/uquantmat/ | | |
| **Research Area** : Quantum Science and Technology (primary), Condensed Matter Physics | | |
| **Methods**: Quantum field theory, quantum information approaches, quantum Monte-Carlo, tensor network approaches | | |

**PhD track subject** : The group conducts theoretical research on the dynamics of correlated quantum matter, in connection with ultracold atoms, quantum optics, and quantum simulation. Our work aims at characterizing novel quantum phases of matter and quantum phase transitions, understand quantum transport as well as out-of-equilibrium dynamics in correlated quantum matter. We are also interested in the application of quantum information theory to condensed matter. To this aim, we develop both analytical and numerical approaches. The PhD track fellow will join one of the ongoing projects on either the characterization and quantum simulation of exotic quantum materials or the application of quantum information approaches to correlated quantum models. The figure below illustrates the propagation of information in a correlated quantum system with long-range interactions. For further information, check our research webpage at https://www.cpht.polytechnique.fr/cpht/uquantmat/!




Causal cone of quantum correlations in spin (up) and Bose (bottom) systems (from Ref. [1])

**Recent publications of the group** :


[1] L. Cevolani, G. Carleo, and L. Sanchez-Palencia, Phys. Rev. A **92**, 041603(R) (2015).
[2] G. Carleo, L. Cevolani, L. Sanchez-Palencia & M. Holzmann, Phys. Rev. X **7**, 031016 (2017).
[3] H. Yao, D. Clement, A. Minguzzi, P. Vignolo, and L. Sanchez-Palencia, Phys. Rev. Lett. **121**, 220402 (2018).
[4] L. Cevolani *et al.*, Phys. Rev. B **98**, 024302 (2018) [selected as Editor's suggestion].
[5] H. Yao, H. Khouldi, L. Bresque, and L. Sanchez-Palencia, Phys. Rev. Lett. **123**, 070405 (2019).
[6] H. Yao, T. Giamarchi, and L. Sanchez-Palencia, Phys. Rev. Lett. **125**, 060401 (2020).
[7] J. T. Schneider, J. Despres, S. J. Thomson, L. Tagliacozzo, and L. Sanchez-Palencia Phys. Rev. Research **3**, L012022 (2021).
[8] R. Gautier, H. Yao, and L. Sanchez-Palencia, Phys. Rev. Lett. **126**, 110401 (2021).
[9] J. T. Schneider, S. J. Thomson, and L. Sanchez-Palencia, Phys. Rev. B **106**, 014306 (2022).