Contribution ID: **31** Type: **Poster**

Dipolar Hubbard and spin systems revisited

Monday, 11 September 2023 22:40 (20 minutes)

In my contribution I will focus on the recent developments of the studies of dipolar gases and dipolar systems in lattices: these are described by extended or non-standard Hubbard model, exhibit strong correlations and lead to many exotic quantum phenomena. I will start with the first observation of the checkerboard state of indirect excitons in a 2D lattice [2] –a direct continuation of our work with François Dubin [1]. I will comment on localization and multifractal properties of the long-range Kitaev chain [3]. Next, I will touch upon interacting topological insulators in 1D fermions with correlated hopping [4]. We will mention about accelerating many-body entanglement generation by dipolar interaction in extended Bose-Hubbard model [5]. We will mention also studies of topological stripe state in an extended Fermi-Hubbard model [6]. We will clearly talk about one-axis twisting as a method of generating many-body Bell correlations [7], and if time permits about many other actual projects at QOYT@ICFO.

[1] M. Alloing, M. Beian, D. Fuster, Y. Gonzalez, L. Gonzalez, M. Lewenstein, R. Combescot, M. Combescot, and F. Dubin, Evidence for a Bose-Einstein condensate of excitons, arXiv:1304.4101, EPL 107, 10012 (2014).
[2] C. Lagoin, U. Bhattacharya, T. Graß, R. Chhajlany, T. Salamon, K. Baldwin, L. Pfeiffer, M. Lewenstein, M. Holzmann, and F. Dubin, Checkerboard solid of dipolar excitons in a two-dimensional lattice, Nature 609, pages 485–489 (2022), https://doi.org/10.1038/s41586- 022-05123-z, arXiv:2201.03311.
[3] Joana Fraxanet, Utso Bhattacharya, Tobias Graß, Maciej Lewenstein, and Alexandre Dauphin, Localization and multifractal properties of the long-range Kitaev chain in the presence of an Aubry-André-Harper modulation, Phys. Rev. B 106, 024204 (2022), arXiv:2201.05458.
[4] A. Montorsi, U. Bhattacharya, Daniel González-Cuadra, M. Lewenstein, G. Palumbo, and L. Barbiero, Inteanrracting second-order topological insulators in one-dimensional fermions with correlated hopping, Phys. Rev. B 106, L241115 (2022), arXiv:2208.00939.
[5] Marlena Dziurawiec, Tanausú Hernández Yanes, Marcin Płodzień, Mariusz Gajda, Maciej Lewenstein-, and Emilia Witkowska, Accelerating many-body entanglement generation by dipolar interactions in the Bose-Hubbard model, Phys. Rev. A 107, 013311 (2023), arXiv:2208.04019v1.
[6] Sergi Julià-Farré, Lorenzo Cardarelli, Maciej Lewenstein, Markus Müller, and Alexandre Dauphin, Topological stripe state in an extended Fermi-Hubbard model, arXivs.
[7] Marcin Płodzień, Maciej Lewenstein, Emilia Witkowska, and Jan Chwedeńczuk, One-axis twisting as a method of generating many-body Bell correlations, Phys. Rev. Lett. 129, 250402 (2022), arXiv:2206.10542v1.

Primary author: Prof. LEWENSTEIN, Maciej (ICFO)

Presenter: Prof. LEWENSTEIN, Maciej (ICFO)

Session Classification: Poster Session II

Track Classification: Quantum Magnetism