

Fractionalization and emergent gauge fields in quantum many-body systems—topological fracton orders

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2021/3/25(Thursday), 13:20

SC001, Science Building III

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Abstract: Quantum many-body systems are exotic phases of matter that many properties are distinct from their classical counterparts. One unique property is fractionalization, where the many-body interactions lead to excitations carrying fractional charges and anyonic statistics. In this talk, I will review the concept of the emergent gauge fields in these quantum many-body systems and demonstrate the fundamental excitations described by the lattice gauge theories. I will introduce a new topological “fracton” order in 3+1 dimensions that hosts immobile excitations.