



Condensed Matter Seminar

物性論セミナー

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Multipole moments and fractional corner charges of insulating materials

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How do we characterize and classify the insulating states of matter? Recent advances in the topological approach in condensed-matter physics offer a classification based on the winding and the quantum entanglement in the ground-state wavefunction. The nontrivial bulk topology is often manifested as anomalous surface states, but only corners and hinges exhibit gapless modes in the case of “higher-order” topology.

In this talk, we discuss that even absolutely topologically trivial materials may exhibit fractional charges on their corners and hinges. To predict these boundary signatures from the bulk, we develop a general formulation of bulk multipole moments, directly generalizing the “modern theory” formulation of the bulk polarization. As an example, we discuss $e/8$ fractional corner charges of grains of table salt and propose their direct measurement using atomic force microscopy.

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