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Disordered Weyl semimetal as an array of coupled Hubbard chains

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We demonstrate that a disordered magnetic Weyl semimetal may be mapped onto a two-dimensional array of coupled replicated Hubbard chains, where the Hubbard U is directly related to the variance of the disorder potential. This is a three-dimensional generalization of a similar mapping of the two-dimensional quantum Hall plateau transition to a one-dimensional Hubbard chain. We demonstrate that this mapping leads to the conclusion that the Weyl semimetal becomes a diffusive metal with a nonzero density of states at arbitrarily weak disorder, in agreement with recent work. We also discuss the absence of localization in strongly disordered Weyl semimetals from the viewpoint of this mapping.

Keyword-1

Topological phases

Keyword-2

Weyl semimetals

Keyword-3

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