Disordered-induced topological phase transitions in Bismuth

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Laura Gomez Paz
Selma Franca, Raquel Queiroz, Adolfo G. Grushin

Univ. Grenoble Alpes, CNRS, Grenoble INP, Institut Néel, 38000 Grenoble, France

laura.gomez-paz@neel.cnrs.fr

Abstract

Crystalline bismuth is a higher-order topological insulator (HOTI) with a very low superconducting critical temperature (~0.1 mK). In contrast, amorphous bismuth is not believed to be topological, but it superconducts at 6K. These differences motivate us to explore how topological properties in bismuth evolve under strong disorder. Our analysis reveals that disorder does not necessarily trivialize bismuth. We present the phase diagram of three-dimensional bismuth as a function of disorder as given by the spectral localizer —a real-space topological marker capable of signaling the trivial to topological phase transition, even when the bulk band gap is small.

References

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[3] Loring T.A., Annals of Physics, 356, 383-416 (2015)
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Figures

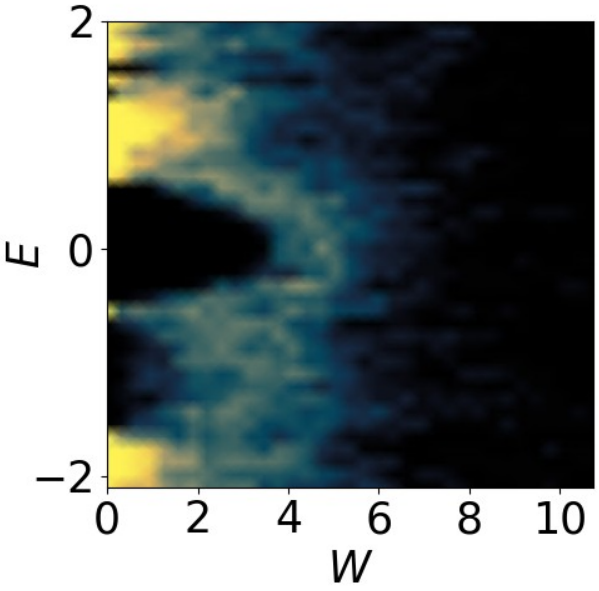

Figure 1: Phase diagram of disordered bismuth given by the spectral localizer

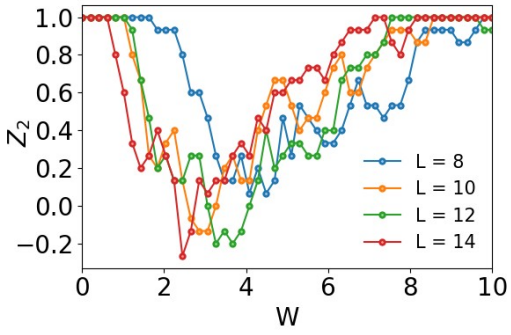

Figure 2: Scaling of the Spectral Localizer invariant