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**Bulk and boundary invariants for complex topological insulators. From  $K$ -theory to physics.**  
(English) [Zbl 1342.82002](#)

*Mathematical Physics Studies*. Cham: Springer (ISBN 978-3-319-29350-9/hbk; 978-3-319-29351-6/ebook).  
xxii, 204 p. (2016).

This book is a contribution to the mathematics of the complex classes of fermionic topological insulators, that is to say those insulators which do not exhibit symmetries in their structures. Firstly, the introductory chapter displays most of the key concepts dealt with in the book and then the authors consider, in a detailed manner, topological solid state systems. The book evolves as follows. Firstly, the authors describe observable algebras for solid state systems and then they arrive at the  $K$ -theory and non-commutative theory for topological solid state systems. The remaining part of the book deals successively with the topological invariants and their interrelations, the index theorems for solid state systems and the connection of invariants with measurable quantities. The book displays in a clear manner the reason why we need to use  $K$ -theory, non-commutative geometry, operator algebra and non-commutative analysis, and all the theory is based on the manipulation of Hamiltonians.

Reviewer: [Guy Jumarie \(Montréal\)](#)

**MSC:**

- [82-02](#) Research exposition (monographs, survey articles) pertaining to statistical mechanics
- [82D20](#) Statistical mechanical studies of solids
- [82D25](#) Statistical mechanical studies of crystals

Cited in <b>1</b> Review Cited in <b>77</b> Documents
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**Keywords:**

topological solid states systems; solid state systems;  $K$ -theory; gauge; non-commutative derivation; observable algebras; Weyl operator; Landau gauge; Kubo formula; topological invariant

**Full Text:** [DOI](#) [arXiv](#)