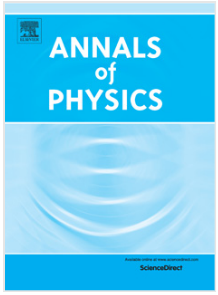
Accepted Manuscript



Symmetry and topology of noncentrosymmetric superconductors

K.V. Samokhin

PII: S0003-4916(15)00157-8
DOI: http://dx.doi.org/10.1016/j.aop.2015.04.024
Reference: YAPHY 66821

To appear in: *Annals of Physics*

Received date: 3 March 2015
Accepted date: 20 April 2015

Symmetry and topology of noncentrosymmetric superconductors

K. V. Samokhin*

Department of Physics, Brock University,

St. Catharines, Ontario L2S 3A1, Canada

(Dated: March 3, 2015)

We present a detailed analysis of the pairing symmetry and the order parameter topology in superconductors without center of inversion. Strong spin-orbit coupling of electrons with the crystal lattice leads to a large splitting of the Bloch bands, which makes it necessary to use a multiband description of superconductivity. We identify stable superconducting states and derive the Bogoliubov-de Gennes Hamiltonian, which determines the spectrum of fermionic quasiparticles. To develop a topological classification of the superconducting states we introduce two different types of topological invariants, the Chern numbers and the Maurer-Cartan invariants, and apply them to three-dimensional noncentrosymmetric superconductors, both with and without time reversal symmetry breaking.

Keywords: noncentrosymmetric superconductors; pairing symmetry; Bogoliubov quasiparticles; topological invariants

I. INTRODUCTION

Recent years have seen a dramatic increase in interest, both experimental and theoretical, in "topological" quantum systems [1]. Their defining property is that the bulk quantum states fall into distinct classes characterized by topological invariants, which remain unchanged under sufficiently small variations of the system's parameters. For example, topological properties of the wave functions in momentum space are known to play a crucial role in many condensed matter systems, from the integer quantum Hall effect (QHE), which was explained in Ref. [2] in terms of the Chern numbers of the magnetic Bloch bands, to topological band insulators [3, 4]. A common feature of topological matter is that,

*Electronic address: kirill.samokhin@brocku.ca