Visualization of topological edge modes in mechanical graphene

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Abstract

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1 Introduction

Breaking time-reversal (TR) symmetry known as to cause the energy gap to open at the Dirac point[2]. By breaking TR, we can introduce topologically protected modes on the material. These topologically protected modes is one of the most important factor for the unique quantum phenomena such as a topological magneto-electri effect, an image magnetic monopole effect, topological Kerr and Faraday rotation, and the quantum anomalous Hall effect (AHE)[2].

In this research, we will verify the idea to break the TR symmetry on the mechanical graphene using coriolis force with non-inertial reference frame of a rotating system with actual device[1, 3]. As an experimental device, we introduce two devices. The first one is 1D spring-mass type chain in which masses are placed on the edge of a circle.

2 Formulation

2.1 1D mechanical lattice on inertial frame of reference

contents

2.2 1D mechanical lattice on non-inertial reference frame

2.2.1 With coriolis force

2.2.2 With coriolis force and centrifugal force

2.3 2D mechanical graphene on inertial frame of reference

2.4 2D mechanical graphene on non-inertial reference frame

2.4.1 With coriolis force

2.4.2 With coriolis force and centrifugal force

3 Experiment

3.1 Experimental setup

contents

3.2 1 dimensional mechanical lattice

3.3 2 dimensional mechanical graphene

4 Result

5 Conculsion

6 Further research

References

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