



The Hong Kong University of Science and Technology

Department of Mathematics

MPhil THESIS EXAMINATION

**Mathematical Theory of
Topological Protected States in Photonic Waveguide**

By

Mr. Jiayu QIU

ABSTRACT

In this thesis, we develop a rigorous mathematical theory for topologically protected edge modes in a two-dimensional photonic/phononic waveguide. We prove that such an edge mode exists at the interface of two periodic photonic/phononic band-gaped materials with distinct topological phases that undergo a phase transition at a Dirac point. The proof relies on layer potential techniques and asymptotic analysis. It is believed that the approach can be extended to study other problems in topological photonic/phononic materials.

Date : 8 August 2022, Monday

Time : 9:00 a.m.

Venue : Room 5508 (Lifts 25/26)

Thesis Examination Committee

Chairman : Prof. Tianling JIN, MATH /HKUST

Thesis Supervisor : Prof. Hai ZHANG, MATH/HKUST

Member : Prof. Guowu MENG, MATH/HKUST

(Open to all faculty and students)

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).