Edge states for magnetic Schrödinger operators in domains with compact boundary

Abstract: In this talk we consider a magnetic Schrödinger operator H in a domain $\Omega \subset \mathbb{R}^2$ with compact boundary. We impose Dirichlet boundary conditions on $\partial\Omega$. For a constant magnetic field having large intensity, we focus on the existence and the description of the *edge states*, namely eigenfunctions for H whose mass is localized along the boundary $\partial\Omega$. The existence of edge states is connected to the study of materials which behave as electrical insulators in the bulk, but may conduct electricity on their boundary (*topological insulators*).
We show that such edge states exist and we give a detailed description of the localization and distribution of their mass along $\partial\Omega$. From this result, we also infer asymptotic formulas for the eigenvalues of H. If time allows, we briefly discuss how the previous localization results generalise to a class of *Iwatsuka models*, namely when the presence of a boundary $\partial\Omega$ is replaced by a fast oscillation of the magnetic field along an interface.

This talk is based on joint works with J.J. L. Velázquez (IAM Bonn).