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Spectral analysis of the magnetic Robin Laplacian

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In this talk, I will discuss the spectral analysis of the Robin Laplacian on a smooth bounded two-dimensional domain in the presence of a magnetic field with moderate and large intensity.

For the moderate case, in the strong coupling limit, when the Robin parameter tends to infinity, I will explore the spectral gap between successive eigenvalues. In the case of the disc domains, I will investigate the contribution of the magnetic field to the lowest eigenvalue asymptotics.

In the case of a large intensity magnetic field, in the semi-classical limit, I will explain how to get a uniform description of the spectrum located between the Landau levels. The corresponding eigenfunctions, called edge states, are exponentially localized near the boundary. By means of a microlocal dimensional reduction, I will explain how to derive a very precise Weyl law and a proof of quantum magnetic oscillations for excited states, and also how to refine simultaneously old results about the low-lying eigenvalues in the Robin case and recent ones about edge states in the Dirichlet case.

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