

**Spectral analysis of a confinement model in relativistic  
quantum mechanics**

Albert Mas

*Universitat Politècnica de Catalunya*

albert.mas.bleesa@upc.edu

In this talk we will focus on the Dirac operator on domains of  $\mathbb{R}^3$  with confining boundary conditions of scalar and electrostatic type. This operator is a generalization of the MIT-bag operator, which is used as a simplified model for the confinement of quarks in hadrons that has interested many scientists in the last decades. It is conjectured that, under a volume constraint, the ball is the domain which has the smallest first positive eigenvalue of the MIT-bag operator.

I will describe our results—in collaboration with N. Arrizabalaga (U. País Vasco), T. Sanz-Perela (U. Edinburgh and BCAM), and L. Vega (U. País Vasco and BCAM)—on the spectral analysis of the generalized operator. I will discuss on the parameterization of the eigenvalues, their symmetry and monotonicity properties, the optimality of the ball for large values of the parameter, and the connection to boundary Hardy spaces.