Contribution ID: **22** Type: **not specified**

Zero modes, heat kernel expansions, spectral zeta functions. A novel approach.

Wednesday 9 September 2015 10:00 (20 minutes)

Many phenomena in statistical physics and quantum field theory are effectively described by means of spectral zeta function techniques.
In particular, one-loop quantum fluctuations around classical backgrounds engender divergences that may be regularized via spectral zeta function
analytic continuation regularization. Tipically, in solitonic and/or gravitational backgrounds, e.g., magnetic monopoles, domain walls, black holes, there are zero energy fluctuation modes. These zero modes cause infrared divergences in the low temperature or long proper imaginary time asymptotics
of the heat kernel expansion. The heat kernel expansion is a necessary ontermediate tool to obtain the zeta function through Mellin's transform. In this talk I wll describe a new method to deal with the infrared regime of the fluctuation spectrum by performing the expansion
with respect to an operator with an algebraic kernel of the same dimension as the Hessian operator. In absence of zero modes the heat kernel expansion starts from the heat kernel of the usual Laplace operator. The new technique will be applied to control the infrared divergent
fluctuations around instantons in quantum mechanics, kinks in one-dimensional QFT, two-dimensional self-dual
vortices in superconducting systems, and domain walls in scalar 3D QFT.

Primary author: Dr JUAN, Mateos Guilarte (Universidad de Salamanca)

Co-author: Dr ALONSO IZQUIERDO, Alberto (Universidad de Salamanca)

Presenter: Dr JUAN, Mateos Guilarte (Universidad de Salamanca)

Session Classification: Session 5