Contribution ID: **107** Type: **Parallel talk**

Point Particle Effective Actions

Thursday 22 June 2017 16:45 (15 minutes)

Nature is full of examples pairings of small but massive compact objects (of linear size R) interacting with and controlling the motions of their neighbours over within a much larger surrounding domain (of size $a \gg R$). For such systems familiar arguments (such as the multipole expansion) show that only a few features of the compact object are relevant to understanding motions in their larger environment.
Effective field theories are the natural language for exploiting this kind of simplicity, though these are often only formulated in a second-quantized language in which all species of particles are represented by their respective quantum field. We explore how to formulate such effective theories using instead a first-quantized language for the heavy compact object, reserving the second-quantized language for the lighter particles with which it interacts. In this situation all information about the source enters observables through the boundary conditions that it implies for fields at the origin; boundary conditions that are completely determined by the source's effective action. Relating these boundary conditions to the source action takes the guesswork out of small-R boundary conditions, and shows in particular why linear boundary conditions are so generic at low energies. Besides this they show how to handle singular potentials (like $V(r) \propto r\hat{}p$ with $p \le -2$) unambiguously, despite the generic absence in these cases [7] of smooth solutions at the origin. Our formalism has various applications, for instance corrections to Coulomb bound energy levels.

Presentation type

Parallel talk

Authors: RUMMEL, Markus; BURGESS, Clifford (High Energy Physics Group - McGill University); Mr ZALAVARI, Laszlo (McMaster University/Perimeter Institute); Mr HAYMAN, Peter (McMaster University/Perimeter Institute)

Presenter: RUMMEL, Markus

Session Classification: Parallel II