Laboratoire LEPRINCE-RINGUET
Ecole polytechnique IN2P3/CNRS

Séminaire

Collective modes in quantum many-body systems: mean-field and linear response

The quantum many-body problem is very complex, due to the interaction between the particles involved. For mesoscopic systems (N~10 to 1000), exact approaches are too costly, whereas statistical ones bear little relevance.
A typical alternative is the mean-field approximation, which replaces the exact problem with ones of independent pseudo-particles. However, this method is poorly suited for the description of collective modes, which stem from correlations that are discarded within the mean-field.
The usual approach consists in including the linear component (=one-body) of the density correlations, resulting in a high-dimensional eigenvalue equation. A rather recent alternative replaces it by a set of non-linear equations of lesser dimension. This new method has, during the thesis, been extended to the situation where the reference state writes as a mixture of configurations, opening up the way to studying finite-temperature systems.
In this talk, the big picture about solving the many-body problem will be presented, before focusing on mean-field and beyond approaches. Finally, a study of the thermal phase transitions and collective modes in the 56Fe nucleus (relevant for astrophysics) will be shown.

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Salle de conférence
et Zoom

Lundi 04 Avril
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