Université Paris-Saclay
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Séminaire de Physique Nucléaire Théorique

Short-range correlations and the nuclear many-body problem

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An accurate description of short-range physics is a significant challenge in the study of strongly interacting quantum many-body systems. In nuclear systems, short-range correlations (SRCs) have been studied extensively in the last decades using both large momentum transfer quasi-elastic reactions and ab-initio calculations. Nevertheless, there is still no systematic framework for describing SRCs and utilizing our experimental and theoretical knowledge of SRC properties for the description of more general observables that are affected by both long-range and short-range physics. In this talk I will present the Generalized Contact Formalism (GCF), an asymptotic theory for the description of SRCs. I will show how it captures quantitatively the impact of correlated pairs on various nuclear quantities, and how it reformed the way experiments are analyzed and designed. I will also focus on recent developments, based on exact short-range expansion of the many-body wave function, introducing sub-leading terms and a clear power counting to the GCF. If time permits, I will also present first results —regarding three-body correlations and calculations of neutrinoless double-beta decay matrix elements.

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