The Abdus Salam International Centre for Theoretical Physics

School in Computational Condensed Matter Physics:
From Atomistic Simulations to Universal Model Hamiltonians

7 - 25 September 2015
Trieste, Italy

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TITLES OF TALKS and Abstract

Lecture 1: Preliminaries for DMRG: An exact diagonalization, Quantum information

Lecture 2: Hands on tutorial on Lecture 1 topics using programming language julia

Lecture 3: Matrix Product states and DMRG

Lecture 4: Hands on tutorial on Lecture 3 topics with ITensor library (C++)

Abstract:

Since my lectures are at the beginning of the school, I will start with basic ideas that are needed for a number of different methods for quantum systems, such as exact diagonalization, entanglement entropy, the Schmidt decomposition, etc. Julia is a free, fast, high level language specifically tailored for scientific calculations, so the first tutorial will use julia. We will progress to matrix product states and DMRG the next day, and have a tutorial using the ITensor library, which is specifically built for DMRG and tensor networks, which is based on C++. There will not be much time for advanced topics, such as 2D or dynamics, but later speakers in the school will have time for some of these topics.