Ruđer Bošković Institute

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THE HIERARCHY OF DAVYDOV TRIAL STATES: FROM GUESSWORK TO NUMERICALLY "EXACT" MANY-BODY WAVE FUNCTIONS

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Numerically exact in the limit of large multiplicity, the multiple Davydov trial states grew out of the semi-classical Davydov solitons in the 1980s.

In particular, the multi-D2 ansatz is especially versatile, capable to handle various forms of particle-boson interactions.

A highly competitive alternative to numerically "exact" methods such as NRG, HEOM, and QUAPI, the time-dependent variation with the multi-D2 ansatz has found applications in a variety of problems ranging from one- and two-impurity spin-boson models, dissipative multi-level Landau-Zener transitions, driven Rabi dimers, to singlet fission dynamics, multidimensional spectroscopy of molecular aggregates, dissipative dynamics at conical intersections, and most recently, hole dynamics in the t-J model and time-resolved fluorescence in TMD monolayers.

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Dr. Zhao was selected from the best of Chinese physics students to pursue PhD studies in the US by the prestigious CUSPEA program (sponsored by Nobel Laureate Tsung-Dao Lee). His Bachelor of Science was awarded by the Zhejiang University , and his PhD degree, University of California at San Diego. Following a brief stay in the International Center for Theoretical Physics in Trieste, Dr. Zhao took up a postdoctoral appointment at the Rochester Theory Center in University of Rochester, where he worked with Prof. Shaul Mukamel in Chemistry and Prof. Bob Knox in Physics. Prior to joining the Nanyang Technological University in 2007, he also held positions in the University of Hong Kong that include Research Assistant Professorship and Honorary Assistant Professorship. Upon arrival in NTU, Dr. Zhao received as PI over 11 million SGD of research funding.