Abstract Submitted
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Spectral signatures of collectivity in heavy nuclei in the shell model Monte Carlo method[1] SOHAN VARTAK, YORAM ALHASSID, Center for Theoretical Physics, Sloane Physics Laboratory, Yale University, New Haven, CT 06520, MARCO BONETT-MATIZ, Physics Department, University of Bridgeport, Bridgeport, CT 06604 — Spectral signatures of the crossover from vibrational to rotational collectivity in heavy nuclei are well known. However, a microscopic description of these spectral signatures in the framework of the configuration-interaction shell model is still lacking because of the large dimensionality of the many-particle model space. The shell model Monte Carlo (SMMC) method enables calculations in model spaces that are many orders of magnitude larger than those that can be treated by conventional methods. While SMMC is a powerful technique to calculate thermal and ground-state observables, it has been a major challenge to obtain information on individual excited states. A method was recently introduced to calculate in SMMC a few many-body energy levels for each spin and parity [1]. The method is based on a generalized eigenvalue problem satisfied by the imaginary-time response matrices of one-body densities. We apply the method to chains of heavy isotopes and find spectral signatures of collectivity that are consistent with the results of phenomenological models. The method can also be used to extract information on one-body transition densities between the ground state and the corresponding excited states. [1] Y. Alhassid, M. Bonett-Matiz and C.N. Gilbreth, to be published.

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Sohan Vartak
Yale University

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