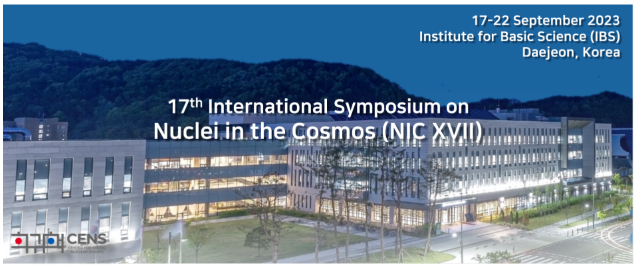

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Understanding collective nuclear excitations within microscopic HFB+QRPA calculations

Tuesday, 19 September 2023 17:00 (5 minutes)

The study of nuclear excitations, particularly collective excitation modes such as the giant resonance (GR) and pygmy resonance (PR), can reveal important characteristics of the underlying nuclear structure. The PR is a fascinating excitation mode that is more prominent in nuclei with an excess of neutrons. This resonance is typically interpreted as a collective motion in which the neutron excess oscillates against a core. It is known to enhance the neutron capture rates, which are crucial for understanding the creation of elements in our universe. However, our knowledge of the low-lying collective excitations remains incomplete despite decades-long efforts to measure and describe collective phenomena. Our inability to include collective effects in reaction calculations affects a range of applications, from nuclear astrophysics to nuclear energy.
In this work, we investigate the low-lying collective excitations in selected Mo isotopes, focusing on the GR and PR modes. Our fully consistent calculations using the Quasi-particle Random Phase Approximation (QRPA) and Hartree-Fock-Bololiubov (HFB) provide valuable insights into the characteristics of these collective excitations. For representative nuclei, we present the electric transition strengths and transition densities, discuss the location of the PR, and investigate the relation between the PR and the neutron excess.

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