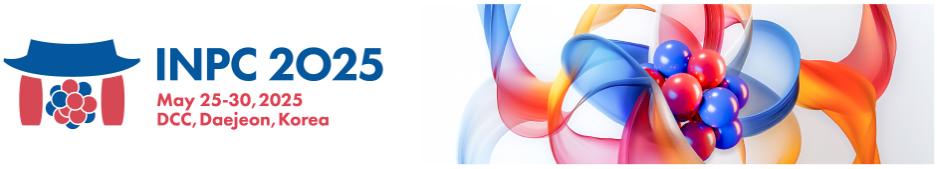

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Exploring exotic dipole excitations into pygmy and toroidal modes

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Exotic dipole excitations, such as Pygmy Dipole Resonances (PDR) and Toroidal Dipole Resonances (TDR), provide valuable insights into nuclear dynamics and structure. The PDR, associated with neutron skin oscillations, represents an excitation mode where weakly bound neutrons oscillate against the core. In contrast, the TDR, characterized by vortical nucleon motion, introduces a distinct mechanism involving nuclear currents rather than density oscillations. While these modes are predicted to coexist in the same low-energy region, their relationship remains unclear.
In this study, we focus on the PDR in selected Mo isotopes using the Gogny HFB+QRPA framework. We analyze dipole response functions and transition densities to identify PDR candidates and investigate their microscopic structure. Preliminary insights into the TDR are also presented, highlighting its unique features and potential connection to neutron skin thickness. Future work will further explore the interplay between these exotic dipole modes and their implications for nuclear structure and astrophysical nucleosynthesis.

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