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Study of isoscalar giant monopole resonance in tin isotopes

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The investigation of compressional-mode giant resonances, specifically the isoscalar giant monopole resonance (GMR), continues to captivate the interest of nuclear physicists. This research is centered on the meticulous analysis of isoscalar monopole resonances within the 112-124Sn isotopic mass chain, aiming to glean profound insights into nuclear matter compressibility. The lingering disparity between experimentally observed GMR energies and theoretical calculations has sparked a fundamental question: Why do theoretical predictions tend to overestimate experimental values, and which interaction model offers the most accurate depiction of empirical data.

In this study, the power of the relativistic Quasiparticle Finite Amplitude Method has been harnessed to systematically explore the intricate characteristics of isoscalar monopole strength across the 112-124Sn isotopic mass chain. To achieve this, a systematic calculation has been performed to obtain strength functions and centroid energies by utilizing the density-dependent meson-exchange and point coupling parameterizations in an axially deformed harmonic oscillator basis. This approach enabled us to discern nuanced patterns in the isoscalar monopole resonance and assess its behavior with respect to different interactions. The obtained results are compared with the experimental data and other available theoretical approaches. For the specific case of 116Sn, the results are compared with the theoretical predictions derived from Skyrme interactions. The findings indicate that the density-dependent meson-exchange interaction aligns well with the available experimental data, outperforming other considered interactions. This highlights the efficacy of the relativistic Quasiparticle Finite Amplitude Method in conjunction with the density-dependent meson-exchange interaction for predicting GMR characteristics.

Attendance Type

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Primary authors: DEVI, Rani (University of Jammu); SHARMA, Sumedha (University of jammu)

Presenter: DEVI, Rani (University of Jammu)

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