

# Insights into the Isovector Giant Dipole Resonance from a Relativistic SRPA Perspective

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**Abstract.** The isovector giant dipole resonance (IVGDR) remains a fundamental probe for understanding nuclear collective dynamics, the symmetry energy of the nuclear equation of state, and the underlying nuclear interaction. While the standard Relativistic Random Phase Approximation (RRPA) successfully describes the centroid energies and transition strengths of these resonances, it cannot reproduce the experimental width and the detailed fragmentation of the strength due to the omission of more complex configurations. In this work, we present a microscopic study of the IVGDR in the closed-shell nuclei  $^{16}\text{O}$  and  $^{40}\text{Ca}$  using a self-consistent Relativistic Second RPA (RSRPA) framework. By extending the configuration space to include two-particle-two-hole (2p-2h) excitations, our approach provides a more comprehensive description of the nuclear response function. Our results demonstrate that the coupling to 2p-2h configurations leads to a redistribution of the dipole strength and a realistic description of the resonance damping mechanisms. We compare our findings with standard RRPA results and available experimental data, highlighting the role of many-body correlations in shaping the excitation spectra of light and medium-mass nuclei. These results demonstrate the relevance of RSRPA in capturing the full complexity of nuclear response, thereby paving the way for future systematic studies across the nuclear chart.