abstract We calculate the transition density for the overtone of the isoscalar giant monopole resonance (ISGMR) from the response to an appropriate external field \( \hat{f}_\xi(r) \) obtained using the semiclassical fluid dynamic approximation and the Hartree-Fock (HF) based random phase approximation (RPA). We determine the mixing parameter \( \xi \) by maximizing the ratio of the energy-weighted sum for the overtone mode to the total energy-weighted sum rule and derive a simple expression for the macroscopic transition density associated with the overtone mode. This macroscopic transition density agrees well with that obtained from the HF-RPA calculations. We also point out that the ISGMR and its overtone can be clearly identified by considering the response to the electromagnetic external field \( j_0(qr) \).
Fig. 1
Fig. 2
Fig. 3a

\[ 4\pi r^2 \rho_r (r) \text{ [arb.units]} \]

\[ r \text{ [fm]} \]

\[ \xi = 78.6 \text{fm}^2 \]
Fig. 3b

\[ 4\pi r^2 \rho_{tr}(r) \text{ [arb. units]} \]

- FLA
- macr

\( \xi = 68.3 \text{ fm}^2 \)
Fig. 4
Fig. 5