

QRPA calculations for M1 transitions and the application to the neutron radiative capture cross sections

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We derive the quasiparticle random-phase approximation (QRPA) equation with a noniterative finite amplitude method, and calculate the M1 transition for deformed gadolinium isotopes. The QRPA result shows the orbital transition in a few MeV energy region where the M1 scissors mode was experimentally confirmed. Then, we apply the QRPA results to calculations of neutron capture reactions based on the statistical Hauser-Feshbach theory. Our result underestimates the experimental data even though the capture cross section is significantly enhanced by the M1 transition. Improvements in the cross section would be possible by considering uncertainties of low energy E1 transition neglected in our QRPA calculation.

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