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Calculation of nuclear matrix element of double-beta decay including the effects of quadrupole and isoscalar pairing fluctuations NOBUO HINOHARA, JONATHAN ENGEL, University of North Carolina at Chapel Hill — We calculate the nuclear matrix element of $0\nu\ \beta\beta$ decay of ^{76}Ge in the closure approximation by describing the initial and final states using the particle-number and angular-momentum projected generator coordinate method (GCM). As the generator coordinates, we choose the quadruple deformation and isoscalar ($T = 0$) pairing gaps, since the quadrupole correlations are essential for the ground state properties, while the nuclear matrix element strongly depends on the residual isoscalar pairing interaction. The present GCM approach takes into account the both correlations beyond the small-amplitude approximations; the GCM allows to describe the phase transition, and gives accurate description for the transitional/shape coexisting ground states, and moreover, the matrix element is reliable even near the transition to the isoscalar-pair phase. The calculation requires the generalized scheme for the Hartree-Fock-Bogoliubov in which the neutrons and protons are mixed in the quasiparticles. The developed codes has been checked with the $SO(8)$ schematic model, and then applied to the $0\nu\ \beta\beta$ decay of ^{76}Ge using the separable interactions consisting of isovector, isoscalar pairings and the Gamow-Teller particle-hole interactions.

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