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Momentum-space quasiparticle RPA calculation with Skyrme energy density functional for rotating weakly-bound nuclei

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We have constructed a new computer code for quasiparticle RPA (QRPA) calculation with Skyrme energy density functional. The matrix QRPA equation is diagonalized by the canonical basis of the Hartree-Fock-Bogoliubov states that break the spatial axial symmetry and the time-reversal symmetry. By using the Fourier-series expansion method, we can reduce the memory size and the computational time of calculations for rotating weakly-bound nuclei.
With this code, we discuss low-frequency quadrupole vibrations of weakly-bound nuclei around 40Mg. These nuclei have quadrupole deformation due to the broken magic number N=28. We emphasize that the coupling to the fluctuation of quadrupole pairing field generates the K=0 mode of quadrupole vibration. Eventually, this mode has strong sensitivity to the collective rotation. The microscopic structure will be clarified.

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