EFFECTS OF PAIRING CORRELATION ON THE LOW-LYING QUASIPARTICLE RESONANCE IN NEUTRON DRIP-LINE NUCLEI

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Weakly bound nuclei near the drip-line have properties that are not seen in strongly bound stable nuclei. The neutron halo is a typical example. Apart from quantal penetration caused by the small separation energy, the neutron pairing correlation plays crucial roles here; e.g., to determine the binding of two-neutron halo nuclei. Note, however, that the pairing correlation in weakly bound nuclei is different from that in stable nuclei since it causes configuration mixing involving both bound and unbound (continuum) single-particle orbits, and this continuum coupling brings about novel features

An interesting example is the possible manifestation of a new type of resonance generated by the pairing correlation and the continuum coupling, called the quasiparticle resonance. If one describes a single-particle scattering problem within the scheme of Bogoliubov's quasiparticle theory, even a scattering state becomes a quasiparticle state that has both "particle" and "hole" components. In other words, an unbound nucleon couples to a Cooper pair and a bound hole orbit, then forms a resonance. This quasiparticle resonance is also expected to exhibit new features in weakly bound nuclei since the continuum coupling becomes stronger as the separation energy decreases.

In this presentation we discuss the effects of pairing correlation on quasiparticle resonance. We analyze in detail how the width of the low-lying ($Ex < 1$ MeV) quasiparticle resonance is governed by the pairing correlation in the neutron drip-line nuclei. We consider the 46Si + *n* system to discuss the low-lying *p*-wave quasiparticle resonance. Solving the Hartree–Fock–Bogoliubov equation in coordinate space with the scattering boundary condition, we calculate the phase shift, the elastic cross section, the resonance width, and the resonance energy. We find that the pairing correlation has the effect of *reducing* the width of the quasiparticle resonance that originates from a particle-like orbit in weakly bound nuclei.