Di-Neutron Correlation in Soft Octupole Excitations of Medium-Mass Nuclei near Drip-Line

Y. Serizawa and M. Matsuo (Niigata Univ.)

Introduction
The pairing properties in nuclei near the neutron drip-line are very interesting issues. We found that the di-neutron correlation (two neutrons which form a pair distribute closely each other) appears in a ground state and a soft dipole mode of near-drip-line nuclei[1]. Our next motivation is whether the di-neutron correlation appears in the other excitation modes. In this talk, we focus on the di-neutron correlation in the soft octupole excitations.

Model
We use the continuum QRPA method to describe of the excited states. The ground state is calculated with the Skyrme HFB method in the coordinate-space representation. The density-dependent delta interaction is used as the pairing force. We approximate the QRPA residual interaction in the particle-hole channel by the Landau-Migdal approximation.

Results
We found that two modes appear in the low energy octupole excitation: (i) a low-energy octupole vibrational state which emerges as a sharp resonance in the strength distribution shown in Fig. 1(left) and (ii) a neutron mode which corresponds to the broad bump just above the neutron threshold. From the analysis of the transition densities(Fig. 1(right)), we found that the di-neutron correlation plays an important role in the neutron mode. The transition densities have the following features: (i) the particle-pair transition density is more significant tail than the particle-hole transition density. (ii) The high-l orbits (those with the orbital angular momentum l much larger than that around the Fermi energy) essentially contribute to the particle-pair transition density. These mean the appearance of the di-neutron correlation in the neutron mode. We also found that the di-neutron correlation is more clear in the soft dipole excitations than the soft octupole ones.

![Figure 1](image)

Figure 1: (left) the octupole strength function of $^{84}$Ni. The solid, dashed, and dotted lines are the isoscalar, neutron, and proton strength, respectively. The arrows indicate the one- and two-neutron threshold energy. (right) the particle-hole (the top panel) and the particle-pair (the bottom panel) transition density. The thick and thin lines represent the full and no dynamical pairing case, respectively. The lines between two solid lines are in the case of $l_{cut} = 7, 9, 11, 13, 15$.

References