DEFORMATION AND NEUTRON-PROTON PAIRING EFFECTS ON THE GAMOW-TELLER TRANSITIONS IN MEDIUM NUCLEI BY USING THE DEFORMED QRPA

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We investigated the effects of the neutron-proton (np) pairing correlations on the Gamow-Teller (GT) transition in medium nuclei such as 56Ni and 56Fe by taking into account the deformation. Our calculations is performed within the deformed quasi-particle random phase approximation (DQRPA) which explicitly includes the deformation at the BCS and RPA stage. In this work, we include the np pairing as well as the nn and pp paring correlations to the DQRPA.

GT transitions play an important role in many astrophysical phenomena. And GT strength distributions are shown to be sensitive to the nuclear shape and pairing correlations. Our new formalism was applied to the GT transition of the well known deformed Mg isotopes in the last work. As the second application we apply to the medium nuclei such as 56Ni and 56Fe nucleus. As you know, these two nuclei are concerned with electron capture and this electric capture rates can determine the fate of massive stars and play key roles in the dynamics of core collapse. In the previous research we showed that Fermi energy level difference of protons and neutrons of 24Mg is larger than of 26Mg and np pairing effect come from the this difference of Fermi energy. According to a shell model calculation, the np pairing effect on GT strength for 56Ni nucleus can be important because 56Ni has the same number of proton and neutron. We also calculate the GT strength for N≠Z 56Fe nucleus to find the effect of np pairing.