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Excitations of ^{4}He induced by electro-weak interactions WATARU HORIUCHI, YASUYUKI SUZUKI, Niigata University, TORU SATO, Osaka University — ^{4}He is the lightest closed shell nucleus which has several excited states above the excitation energy of 20 MeV. We have recently reported that all the observed levels below 26 MeV are well reproduced in a full four-body calculation using realistic interactions (Phys. Rev. C **78**, 034305 (2008)). It is very interesting to extend this approach in order to study some excitations in ^{4}He. In the energy region around 26 MeV, photoabsorption reaction occurs mainly through the electric dipole transition. The current experimental situation is controversial. Some experiments show different cross sections. Because there are only few theoretical studies on the dipole strength starting from a realistic interaction, further theoretical study may help clarify the situation. A study of neutrino-nucleus reaction is important to the scenario of a supernova explosion. In the final stage of a core collapse supernova, ^{4}He is exposed to intense flux of neutrino. The ν-^{4}He reaction is expected to play a significant role, and the reaction rate is proportional to the weak responses, for example, due to Gamow-Teller, spin-dipole, etc. operators. In this contribution, we will discuss electro-weak responses from the ground state of ^{4}He to its continuum states by performing a full four-body calculation using realistic interactions. The photo-absorption and ν-^{4}He reaction cross sections are discussed.

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