POSSIBLE EXPERIMENTAL SEARCH OF RESONANT TRI-NEUTRON STATE ^{3}N

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The property of the T=1/2 three-nucleon forces (3NF) is relatively well known, while that of T=3/2 3NF is poorly known because of experimental difficulties. Information on the T=3/2 3NF is important not only for its own shake but also for nuclear structure as well as for EOS for example of neutron star. Recently a candidate of a resonant tetra-neutron state ^{4}n was discovered at Ex=0.83 MeV with a width of 2.6 MeV (Kisamori et al., PRL 116, 052501(2016)). It is pointed out theoretically that unrealistically strong T=3/2 3NF is required to reproduce the experimental result.

The success of the experiment is partly due to the success of creating four neutrons at rest in the laboratory system, namely recoil-less condition by using an exothermic double charge-exchange (DCE) ^{4}He(^{8}He,^{8}Be)4n reaction utilizing a large mass excess (31.6 MeV) of ^{8}He. In the light of the experimental success of creating ^{4}n, an experimental feasibility to observe a resonant tri-neutron state ^{3}n near its threshold energy is studied in view of realizing a recoil-less 3n state. The existence of ^{3}n depends strongly on the strength of T=3/2 3NF.

The candidate reactions are ^{3}H(^{3}H,^{3}He)3n or ^{3}H(^{9}Li,^{9}Be)3n for the single CE reaction and ^{3}He(^{11}Be,^{11}C)3n for the DCE reaction. The merit and demerit of those reactions considering experimental feasibilities will be discussed. Particular emphasis is placed on the estimation of the non-resonant background production which might be of essential importance to observe the resonant ^{3}n state in the continuum.