New polarization test for Delta-isobar admixture in He^3

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Isobar states in nuclei are one of the simplest manifestations for non-nucleon degrees of freedom. They were discussed during 30 years. In spite of this fact, up to now we have no convincing evidence of their experimental observation. There are two reasons for that. First of all, it is difficult to discriminate between the signal (pion-nucleon pair) from "pre-existed" Delta-isobar and the signal from Delta-isobar which is produced during the interaction and, in some cases, from accidental correlation of independently flying out pion and nucleon. Secondly, the "pre-existed" isobar in nucleus is strongly out of mass shell and any dynamical estimations are unreliable. The essential progress is possible via the application of criteria based on the conservation of discrete quantum numbers and the peculiarities of spin states. In present contribution a new test is proposed based on the fact that the spectator isobar generally must have tensor polarization and the angular distribution of its decay products will be non-isotropic [1]. The case of He^3 is unique. Here the isobar must be predominantly in D-state due to correlation of quantum numbers [2,3]. It can be shown that its tensor polarization achieves the maximum possible value. The angular distribution of the form $(1 + 3z^2)$ is predicted. Here z is the cosine of the angle between the pion direction in the isobar system and the isobar direction in the laboratory system. The investigation of possible contribution for S and P isobar states is also discussed. So the procedure, which can give the convincing evidence for the Δ-admixture in He^3, seems in such a way: (i) the application of the above test with the selection of events where the isobar goes to backward hemisphere; (ii) taking into account large predicted ratio of $(\pi^+p)/(\pi^-p)$ pairs [2]; (iii) taking into account that the momentum distribution of spectator isobar must be rather broad and has a maximum at 350 - 400 MeV/c [4].

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