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A nuclear reaction study with the halo nucleus 6He: elastic scattering and neutron transfer in the 6He+p reaction

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The nuclear reaction ^{6}He+p was investigated at 8 MeV/u. ^{6}He is a halo nucleus, and it has a three-body α+n+n structure. It is the lightest halo nucleus and is bound by about 1 MeV against the α+n+n breakup. Moreover, there is no core excitation in ^{6}He and the interactions between the ^{6}He constituents (i.e. the alpha particle and the neutrons) with the target (proton) are well known. The study of the elastic and neutrons transfer reactions for the ^{6}He+p system could shed important properties on the transfer mechanisms and on the halo structure. The reaction was performed using a new developed exotic beam at CRIB (CNS, university of Tokyo). The ^{7}Li(d,^{3}He)^{6}He reaction was used to produce the radioactive ^{6}He beam: the ^{7}Li primary particles were accelerated with the AVF cyclotron (RIKEN) at an energy of 8.3 MeV/u and the intensity and energy of the secondary ^{6}He beam were 10^{5} pps and 8 MeV/u respectively. The detection set-up for the charged particles was composed of 6 silicon telescopes at different angles and at a distance around 150 mm from the CH_2 target. We have measured simultaneously the ^{6}He(p,p)^{6}He, ^{6}He(p,t)^{4}He and ^{6}He(p,d)^{5}He reactions in a wide angular range allowing a full description of the reaction processes. The breakup of the ^{6}He was also observed. By investigating the 1n and 2n transfer reactions information on the halo structure could be inferred. The (p,t) and (p,d) reactions can be described in the DWBA formalism using ^{6}He+p CDCC scattering wave-functions. Preliminary results will be presented.

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