FOUR- AND THREE-BODY DYNAMICS IN ^{6}LI SCATTERING

Shin Watanabe[1], Takuma Matsumoto[2], Kazuyuki Ogata[3], Masanobu Yahiro[2]
[1]RIKEN, Nishina Center, Wako, Saitama 351-0198, Japan
[2]Department of Physics, Kyushu University, Fukuoka 812-8581, Japan
[3]Research Center for Nuclear Physics (RCNP), Osaka University, Ibaraki 567-0047, Japan

We investigate four-body dynamics of ^{6}Li elastic scattering on heavy targets (n+p+α+T; T=target) and clarify the projectile-breakup mechanism. Since the n+p subsystem of ^{6}Li has a bound state as deuteron (d), in the scattering, there exist not only four-body breakup processes (^{6}Li+T→n+p+α+T) but also three-body breakup processes (^{6}Li+T→d+α+T). This makes reaction dynamics more complicated in ^{6}Li scattering than in scattering of Borromean systems such as ^{6}He (n+n+α+T). In order to take into account both the breakup processes explicitly, we adopt the four-body version of continuum-discretized coupled-channels method (four-body CDCC) based on the n+p+α+T model. Four-body CDCC reproduces measured elastic cross sections without introducing any adjustable parameter. Therefore, we can clearly investigate which of four- and three-body breakup processes is favored in ^{6}Li scattering. Our analyses show that the coupling between the elastic and three-body breakup channels is strong, whereas the coupling between the elastic and four-body channels is negligibly small. This suggests that ^{6}Li is mainly broken up into d+α and hardly into n+p+α in scattering. We refer to this property as dα-dominance. Using dα-dominance, we also propose an effective three-body model that simulates full four-body CDCC calculations. The three-body model is quite useful since the treatment is much easier than four-body one.