Study of the interplay between the ^{8}B breakup and other reaction mechanisms by means of the CDCC method. *

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Recently it has been shown that the standard ways of determining polarization potentials are not useful to describe the breakup cross section in terms of a one-step process. Because the continuum couplings are strongly non-local the complexity of coupled channel methods may well be unavoidable [1].

In the present work the effect of the breakup process on the fusion induced by proton halo projectiles is investigated through the behavior of the quasi elastic barrier distribution (QEBD) of the system ^{8}B + ^{58}Ni. The competition between the breakup channel and inelastic excitations and the behavior of their corresponding polarization potentials are studied by means of CDCC calculations. We performed several calculations including couplings with channels associated with ^{8}B breakup and ^{58}Ni collective states. Switching on and of the couplings with each kind of channel, we determined their separate influence on the QEBD. While the breakup coupling shifts the barrier distribution to higher energies, reduces slightly its maximum and makes the distribution broader, the coupling to inelastic channels shifts the distribution to lower energies and leads to a second maximum at higher energies. When both couplings are considered, the shifts toward opposite directions cancel and the barrier remains close to its nominal value. This fact is interpreted as: the repulsive polarization potential associated with breakup cancels the attractive one resulting from the coupling with the target collective states [2].

We have used the CDCC method to investigate the effects of breakup coupling on ^{8}B + ^{58}Ni elastic scattering. Our results were compared with the recent data of Aguilera et al. [3]. The results of our calculations were in excellent agreement with the experimental results. The effect of inelastic excitations and of continuum-continuum couplings on the angular distributions has been also investigated. We found that inelastic excitations do not have an appreciable influence while continuum-continuum couplings are of utmost importance. It has been shown that the multipole expansion of the coupling interaction is dominated by monopole, dipole and quadrupole terms. Higher multipoles can be neglected. The relative importance of Coulomb and nuclear breakups and their interference were also investigated. For this purpose, we perform CDCC calculations switching of each of these interactions, and comparing the results with the ones obtained with the full couplings. The repulsive character of the polarization potential associated with Coulomb breakup was found in the barrier region. On the other hand, the results for purely nuclear breakup coupling fall slightly below the results of the single-channel calculation. When both nuclear and Coulomb breakup couplings are taken into account, there is a destructive interference between the two amplitudes and the angular distribution lies slightly above the no-coupling results.

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