Higher-order and E2 effects in medium energy ^{8}B breakup

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Longitudinal momentum distributions of ^{7}Be fragments following the dissociation of ^{8}B on heavy, highly charged target nuclei show forward-aft asymmetries [1, 2, 3], the result of interference of electric quadrupole (E2) transitions with the dominant E1 excitation process. These asymmetries can therefore be used to gain insight into the E2 contributions to the breakup process. To assess the sensitivity of these E2 interference terms to the assumed reaction mechanism, in particular the rôle of higher-order coupling effects at medium energies, coupled discretised continuum channels (CDCC) calculations [4, 5] are carried out for ^{8}B breakup at 44 and 81 MeV/u on heavy targets. The effects of higher-order processes due to both Coulomb and nuclear breakup mechanisms can be estimated. In line with earlier work [6, 7, 8] we find that the asymmetries produced by the calculations are reduced when including the higher-order couplings, reflecting an effective quenching of the E2 contributions [9]. The full CDCC calculations show less asymmetry than the available experimental data, suggesting that the structure or reaction model now contains insufficient E2 strength. This contrasts with the results [2] of lowest-order reaction theories which conclude that the ^{8}B model E2 amplitudes are too large.

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