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Direct Measurement of Fusion Reaction in ^{8}B + ^{40}Ar using the Active-Target TexAT

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The investigation of reaction mechanism involving weakly bound (stable and unstable) nuclei has been a subject of great interest in the last years. In particular, the low binding energy and strong cluster configuration in halo nuclei produces a decoupling between the valence particle and the core nucleus, which give rise to an increase of the breakup and/or transfer probability in the total reaction cross section [1,2]. It has been observed that the coupling of these direct processes affects the total fusion cross section producing a suppression at energies above the Coulomb barrier and an enhancement at sub-barrier energies, when compared with no-coupling one dimensional barrier penetration. Measurements of fusion cross section involving unstable nuclei are usually performed with indirect methods which most of the times are model dependent. For instance, fusion in ^{8}B+^{58}Ni (below barrier) [3] and ^{8}B+^{28}Si (above barrier) [4] were measured from evaporation yields of proton and alpha particles, respectively. Inconsistencies between these experimental results and predictions from coupled channel calculations are still not fully understood. To address these open questions, a direct fusion measurement for the ^{8}B+^{40}Ar system at near Coulomb-barrier energies was performed at the Cyclotron Institute of the Texas A&M University using the active target TexAT (Texas Active Target) [5]. The present technique allowed a clear identification of fusion events from other reaction channels, as well as the evaporated charged particles, by reconstructing their tracks in the 3D space and energy deposited in the gas target. Results of this measurement will be presented and the comparison with the ^{8}B+^{58}Ni and ^{8}B+^{28}Si existing data will be discussed [6].

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