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Breakup Dynamics of a Neutron-Halo System at Sub-Barrier Incident Energies

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This study uses the Continuum Discretized Coupled Channels (CDCC) formalism to investigate the breakup of the neutron-halo nucleus 11Be on a Pb target at and below the Coulomb barrier.

The research finds that at sub-barrier incident energies; the breakup cross section is more significant than the total fusion cross section. This is attributed to a strong enhancement of the breakup cross section by continuum-continuum couplings, which specifically boosts the Coulomb breakup component while suppressing the nuclear breakup component. This enhancement is theorized to be due to projectile breakup on its outgoing trajectory.

This observation, also seen with the proton-halo nucleus 8B, suggests that breakup can be the dominant reaction channel for weakly-bound systems at deep sub-barrier energies.

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