

Baryon-Dominated Dwarf Galaxy Enhanced by Weakened Gravitational Binding in Galaxy Collisions

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Baryon-dominated dwarf galaxies (BDDGs) can emerge from high-velocity collisions between gas-rich ultra-diffuse galaxies. Using hydrodynamical simulations with progenitors of contrasting gravitational binding energies, we show that progenitor structure critically regulates BDDG formation. Specifically, collisions involving more weakly bound progenitors sustain star formation longer and yield more massive BDDGs, whereas tightly bound progenitors experience stronger tidal winds that preferentially produce multiple low-mass remnants. While both bursty stellar feedback and elastic self-interacting dark matter can generate cored halos, only feedback injects energy and boosts the BDDG formation. Our results position collisional BDDGs as a novel probe of feedback-regulated galaxy formation and dark matter physics. Upcoming wide-field imaging (CSST, LSST), HI surveys (FAST), and kinematic follow-up will be crucial for identifying candidates and testing these scenarios.

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