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Polar ring structures in simulations of minor mergers of galaxies.

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Substructures formed during the accretion of mass in the process of structure and galaxy formation can be used as a test to study the presence and nature of dark matter.

In this particular talk we study the formation of polar ring galaxies via minor mergers of galaxies. We used N-body + hydrodynamics simulations to reproduce the dynamics of the observed system AM 2229-735 that is a minor merger whose interaction signals are those of a progenitor for a polar ring galaxy. We used the observational information of the system to get initial conditions for the orbit and numerical realizations of the galaxies to run the simulations. Our simulations reproduce the global characteristics of interaction observed in the system such as arms and a material bridge connecting the galaxies. As a merger remnant, we found a quasi-stable and self-gravitating planar tidal stream with dark matter, stars, and gas orbiting in a plane approximately perpendicular to the main galaxy disc leading in the future to a polar ring galaxy. We studied the dynamical conditions of the polar structure and found evidence suggesting that this kind of merger remnant can settle down in a disc-like structure with isothermal support, providing inspiring evidence about the process of formation of galactic discs and providing a potentially independent scenario to study the presence of dark matter in this kind of galaxies.

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