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Primordial black holes as a natural dark matter candidate in supersymmetry

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Primordial black holes (PBH) are a natural and generic dark matter candidate in supersymmetry. In the early universe, the flat directions of supersymmetry form scalar condensates with large expectation values. These condensates can subsequently fragment into non-topological solitons, SUSY Q-balls, which become the building blocks of PBHs. The PBH masses resulting from supersymmetry naturally fall into the sublunar mass window, where the PBHs can account for all dark matter. We will discuss two scenarios which result in the formation of PBHs. First, if the SUSY Q-balls dominate the energy density of the universe then statistical fluctuations and gravitational forces allow for the formation of PBHs in this intermediate matter-dominated era. Second, SUSY Q-balls may interact via a light scalar mediator. This attractive force allows for the formation of structure even in the radiation dominated era, while simultaneously removing energy and angular momentum from the systems of solitons by means of scalar radiation. These mechanisms are able to explain the present-day dark matter abundance in addition to potential candidate events observed with lensing experiments.

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