



Contribution ID: 340

Type: **not specified**

Supersymmetric flat directions and formation of primordial black holes

Monday, 23 August 2021 23:35 (20 minutes)

Supersymmetric flat directions develop large expectation values in the early universe, leading to formation of SUSY Q-balls and ultimately primordial black holes (PBH). This makes PBHs a natural and generic dark matter candidate in supersymmetry. 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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Session Classification: Early Universe Cosmology

Track Classification: Early Universe Cosmology