The 22nd International Conference on
Strangeness in Quark Matter
22-27 March, 2026, Los Angeles, CA

Contribution ID: **223** Type: **Oral Presentation**

Strange Quark Matter as Dark Matter

Wednesday, 25 March 2026 11:15 (20 minutes)

Forty years ago, Witten suggested that dark matter might consist of macroscopic droplets of strange quark matter, formed during a cosmological first-order phase transition. Although lattice QCD at small baryon chemical potential points to a smooth crossover, scenarios in which the early Universe still encounters first-order dynamics remain plausible. We revisit the conditions under which strangelets could form and survive to the present day, considering both first-order and non–first-order cosmological cooling scenarios. We describe the main physical processes that can lead to their formation, stabilization, and partial evaporation, and we estimate the resulting mass distributions in light of current observational constraints. We also show that strangelets could exist with masses <10¹⁷ g, a range in which primordial black holes are excluded, making it possible to distinguish between these two dark-matter candidates.

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Session Classification: Parallel VII: EoS and Astrophysics