

論文の内容の要旨

Cosmological implications of non-topological solitons

(ノントポロジカルソリトンの宇宙論への影響)

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In this thesis, we mainly focus on two cosmological issues: charged soliton dark matter scenario, and inflatonic solitons in a recently motivated inflation model. Former is realized after the Affleck-Dine baryogenesis through the partial decay of Q-balls. We focus on the fact that these objects are detectable by the usual electromagnetic processes, unlike the ordinary neutral Q-balls. We apply the most stringent constraint from the MICA experiment to the model where the charged Q-balls are realized. We find that the MICA constraint is severer than those from IceCube, which probe neutral Q-ball process, leading to the smaller allowed parameter region. Secondly, we study the inflaton fragmentation into I-balls in E-models of α -attractors. These are observationally favored due to the asymptotic flatness of the potentials, which can lead to the local fragmentation. Through the linear instability analysis and the lattice simulation, we find that the I-balls are formed for $\alpha < 10^{-3}$, which is larger than in the case of T-models: $\alpha < 10^{-4}$.