論文の内容の要旨

Cosmological implications from supersymmetric axion models -- origin of matter and its fluctuations

（超対称性アクシオンモデルにおける物質とその揺らぎの起源）

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The matter-antimatter asymmetry and the existence of dark matter are unsolved mysteries that current cosmology and the Standard Model cannot explain. Supersymmetry (SUSY), the symmetry of bosons and fermions, adds a full new set of partner particles to the Standard Model and the partner particles are thought to be candidates of dark matter. On the other hand, axion is a particle beyond the Standard Model, which is introduced as a solution of the strong CP problem. Thus, we consider axion models in the framework of SUSY that solve these problems. In SUSY axion models, axino, a supersymmetric partner of the axion exists and is also a candidate for dark matter. In this thesis, we investigate SUSY axion models that solve the matter-antimatter asymmetry and the dark matter problem simultaneously. The Affleck-Dine (AD) mechanism is a promising baryogenesis model that explains the matter-antimatter asymmetry, and can generate a non-topological soliton, Q-ball during generating the baryon number. If one assumes that Q-balls decay into dark matter particles, baryons and dark matter have same origin, Q-ball. Therefore the Q-ball decay can naturally explain the observational fact that the energy

densities of the two components are at some order. In the thesis, we assume axino dark matter and the gauge mediated SUSY breaking to produce Q-balls. The decay takes place well before the Big Bang Nucleosynthesis (BBN) and also the decay into the supersymmetric particles of the Minimal Supersymmetric Standard Model (MSSM) is kinematically prohibited until the very end of the decay. As a result, we can safely make their abundances small enough for the successful BBN.