

# 論文の内容の要旨

## Realistic Construction of Axion Model with Gauged Peccei-Quinn Symmetry

(ゲージ対称性に伴う Peccei-Quinn 対称性の現実的な構成)

鈴木 資生

To date, the most elegant and intriguing solution to the Strong CP problem has been the Peccei-Quinn (PQ) mechanism. The PQ symmetry may, however, be explicitly and badly broken by the quantum gravity effect. Then, to be consistent with the measurement of the neutron electric dipole moment, it is expected that the PQ symmetry is explicitly broken by only highly suppressed non-renormalizable terms. In this thesis, to understand the origin of the PQ symmetry with such high quality, we suggest one general mechanism where the PQ symmetry is protected well by the gauge symmetry. We call this protection gauge symmetry as the gauged PQ symmetry. For one effort, we apply the mechanism to the model where the origin of the PQ symmetry breaking and the supersymmetry breaking is same. From this work, we find a cosmological problem with extra fermions introduced to cancel the anomaly of the gauged PQ symmetry. Those fermions tend to behave as the dark radiation and eventually induce an unacceptably large number of the effective neutrino species. To resolve this problem, we propose one simple model with no un-wanted fermions. This model is the first realistic axion model with the gauged PQ symmetry.