

824th ASRC Seminar

Date: 7月 26日(火), 13:30 ~ 15:00

Location: 先端基礎交流棟2階ロビー及び
Zoomによるオンライン開催

Speaker: 長村 尚弘 氏(名古屋大学)

Title: Contribution of the Weinberg-type Operator to
atomic and nuclear electric dipole moments

Abstract:

The matter dominant Universe is a cosmologically important phenomenon which cannot be explained by the standard model (SM). Indeed, a large CP violation is required to realize the matter dominance. However, the CP violation of the SM does not fulfill this criterion and hence the experimental search for new physics beyond the SM is actively pursued. The electric dipole moment (EDM) is a CP-violating observable sensitive to new physics which has been explored experimentally in various systems. The measurements of the EDMs in atomic systems are especially attracting attention, thanks to their high sensitivity, which can for certain regions of the parameter space, be higher than the experimental constraints obtained by the LHC experiments. The contribution of the CP violating three-gluon Weinberg operator to the atomic and nuclear EDMs is estimated using QCD sum rules. After calculating the transition matrix element between the pion and the vacuum through the Weinberg operator, we obtain the long-range CP-odd nuclear force by determining the isovector CP-odd pion-nucleon vertex, using chiral perturbation theory at NLO. The EDMs of ^{199}Hg , ^{129}Xe , ^{225}Ra , ^2H , and ^3He are finally given including comprehensive uncertainty analysis. While the leading contribution of the ^{199}Hg EDM is given by the intrinsic nucleon EDM, that of ^{129}Xe atom may be dominated by the one-pion exchange CP-odd nuclear force generated by the Weinberg operator.

<Contact for Zoom URL>

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