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Title(English)	Spectral Functions of Hadrons in Vacuum and Nuclear Matter from QCD Sum Rules
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要約

The strong interaction between quarks and gluons is described by the Quantum Chromodynamics (QCD) and thus the properties of the hadrons which are made of quarks and gluons are also understood from QCD. However, it is difficult to investigate the hadron properties directly from QCD because one can not apply the perturbative methods to their calculations due to the large coupling constant. Additionally, the light hadrons are affected by the spontaneous breaking of the chiral symmetry, and as a result, their properties become more complicated. The relation between the hadron properties and the spontaneous breaking of the chiral symmetry is not understood completely. The relation can be studied from the in-medium hadron properties since it is pointed out that the chiral symmetry is partially restored in the nuclear matter and its restoration affects the hadron properties. The investigation of hadron properties in vacuum and nuclear matter from QCD is one of the important subjects of the hadron physics.

In this thesis, the properties of the phi meson, nucleon and its negative parity excited state in vacuum and nuclear matter are investigated from QCD sum rules with maximum entropy method (MEM). The QCD sum rule is one of the non-perturbative methods and has been applied to the analyses of many hadronic channels. Although many studies successfully reconstruct hadron properties, there are pointed out some problems. We develop and construct the parity projected Gaussian sum rule and phase-rotated Gaussian sum rule in the nucleon channel to remedy these problems.

The thesis is organized as follows. The properties of QCD are introduced in Chapter 2. In Chapter 3, we explain the QCD sum rule in some detail. Next, we discuss the difficulty of the analyses with QCD sum rule and introduce the maximum entropy method in Chapter 4.The results of the phi meson analyses in vacuum and nuclear matter are given in Chapter 5. We obtain the relation between medium modification of the phi meson and the strangeness content of the nucleon. The results of the nucleon analyses in vacuum and nuclear matter are given in Chapter 6, 7 and 8. We derive the information on both the nucleon and its negative parity excited states in vacuum and nuclear matter. The sum rules show some interesting features (1) that the difference between the positive and negative parity states are caused by spontaneous breaking of the chiral symmetry and (2) that their in-medium properties are strongly related to the density dependence of the scalar and vector quark condensates. The conclusion and outlook are given in Chapter 9.