

HAW09-2009-000318

Abstract for an Invited Paper
for the HAW09 Meeting of
the American Physical Society

Recent topics of hadrons in nuclei

DAISUKE JIDO, Yukawa Institute for Theoretical Physics, Kyoto University

The investigation of the properties of hadrons in nuclei is one of the important subjects of contemporary nuclear physics. Especially, production and confirmation of meson-nucleus bound systems are challenging both in experimental and theoretical points of view. With the structure of the (quasi)bound states, one can learn the in-medium properties of individual hadrons, and also universal consequences among the in-medium effects on the hadrons, such as the in-medium quark condensate. In this talk, I briefly review the recent topics of hadrons in nuclei. First, I will show that the in-medium properties of pion do relate to the quark condensate in finite density based on an exact sum rule derived recently by exploiting operator relations in QCD. We will discuss the consequences obtained in the deeply bound pionic atoms based on the sum rule. For the mesonic nuclei, I emphasize that, to understand physics of mesons in nuclei, detailed knowledge of baryon resonances is also important, since the meson inside the nucleus excites one of the nucleons and creates a baryon resonance. The interesting examples are $N(1535)$ in the eta mesonic nuclei and $\Lambda(1405)$ in the kaon and nucleus systems. For the η mesonic nuclei, I discuss a possibility of the level crossing between the eta and $N(1535)$ -hole modes caused by the reduction of the mass gap between N and $N(1535)$ in the context of partial restoration of chiral symmetry. For the kaonic nuclei, reviewing the present status of $\Lambda(1405)$, I discuss the important role of $\Lambda(1405)$ and possible hadronic molecular states with multiple kaons.