

HAW09-2009-020025

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

Spectroscopy of $S = -1$ hypernuclei at KEK, BNL and J-PARC

HIROKAZU TAMURA, Tohoku University

The hypernuclear physics program at J-PARC will start soon. Taking this occasion, I will summarize what we have achieved in the spectroscopy of Λ hypernuclei at KEK-PS and BNL-AGS using meson beams, where the SKS spectrometer and the Ge detector array, Hyperball, have played essential roles. The (π^+, K^+) reaction spectroscopy data in a wide mass range clearly demonstrated single-particle orbits of a Λ even in a heavy nucleus and revealed properties of the Λ 's nuclear potential. Then almost full set of p-shell Λ hypernuclear gamma-ray data provided the strengths of each of the Λ -N spin-dependent forces (spin-spin, spin-orbit, and tensor interactions). In addition, the (π^-, K^+) reaction was successfully introduced to observe neutron rich hypernuclei as well as to study Σ -nucleus interaction. Future perspectives at the J-PARC 50 GeV proton synchrotron are also discussed. At J-PARC, the K1.8 beam line and the SKS spectrometer are almost ready to get the first beam. We plan gamma-ray spectroscopy experiments covering a wide mass range, from ${}^4_{\Lambda}\text{He}$ to sd-shell hypernuclei such as ${}^{19}_{\Lambda}\text{F}$, and then even heavier ones, using a newly-constructed Ge detector array, Hyperball-J. The (π^-, K^+) spectroscopy of neutron-rich hypernuclei will be also exploited. One of the physics motivations of these experiments is to investigate the three-body ΛNN force caused by ΣN - ΛN coupling. We also try to extend the hypernuclear chart toward the neutron drip line and to investigate possible modifications of deformation induced by a Λ . In future, more $S=-1$ hypernuclear experiments are also planned at the K1.1 beam line and the high-resolution pion beam line with the dispersion matching technique.