The first Gamma-ray Spectroscopic Study of *sd*-shell Hypernucleus, ${}^{19}_{\Lambda}$F

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Gamma-ray spectroscopy experiments of Λ-hypernuclei have played an important role to study ΛN interaction. Since 1998 year, gamma rays from several *p*-shell hypernuclei (${}^{7}_{\Lambda}$Li, ${}^{9}_{\Lambda}$Be, ${}^{11}_{\Lambda}$B, ${}^{12}_{\Lambda}$C, ${}^{15}_{\Lambda}$N and ${}^{16}_{\Lambda}$O) measured successfully by using germanium detectors at KEK and BNL [1]. From these studies, the strength of ΛN interaction associated with spin dependent parts was determined well.

At the J-PARC K1.8 beam line, a new gamma-ray spectroscopy experiment of ${}^{19}_{\Lambda}$F (J-PARC E13) will be started in June, 2015, and it will be the first measurement of *sd*-shell hypernuclei [2]. ${}^{19}_{\Lambda}$F is produced through the (K^-, π^-) reaction with the beam momentum of 1.8 GeV/c and a liquid CF4 target (20 g/cm^2). SKS (Superconducting Kaon Spectrometer) and K1.8 beam line spectrometer are used to identify the produced ${}^{19}_{\Lambda}$F and to measure its binding energy. In coincidence, gamma rays from the hypernuclei are detected by Hyperball-J, which is a new generation germanium detector array constructed to be used at J-PARC [3]. Several gamma rays from ${}^{19}_{\Lambda}$F are expected to be observed in this experiment. They will reveal precise energy levels of the hypernuclei. Especially, the strength of ΛN spin-spin interaction in *sd*-shell hypernuclei can be estimated through the energy spacing of the ground state-doublet of ${}^{19}_{\Lambda}$F. By comparing its strength between the *sd* and *p*-shell hypernuclei, a radial dependence of ΛN interaction will be investiagated. In addition, gamma rays from several hyper-fragments such as ${}^{18}_{\Lambda}$O after one proton emission from ${}^{19}_{\Lambda}$F can also be measured in the present experiment.

We will report the first experimental result in this contribution.

[1] H. Tamura, Prog. Theor. Phys. Suppl. 185, 315-334, (2010).

[2] H. Tamura *et al.*, Nucl. Phys. A 881 (2012) 310.

[3] T. Koike *et al.*, in Proceedings of the IX International Conference on Hypernuclear and Strange Particle Physics, SIF and Springer-Verlag Berlin Heidelberg, 2007, ed. J. Pochodzalla and Th. Walcher, p. 25.