

Productions of ${}^{19}_{\Lambda}\text{F}$ and the electromagnetic properties

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One of the most challenging experiments to be done soon at J-PARC is to measure γ -rays from the sd -shell hypernucleus (${}^{19}_{\Lambda}\text{F}$) in order to get novel information on the g -factor of Λ hyperon within the nuclear medium (cf. E13 proposal by Tamura et al.). The γ -ray measurements in p -shell hypernuclei have already provided us with remarkable possibility of high-precision spectroscopic studies in relation with the ΛN interaction properties. Although the level structures of sd -shell nuclei are rather complex in comparison with p -shell ones, the addition of a hyperon will provide new rich aspects of strangeness many-body systems such as interplays between hyperon motion and nuclear core deformation. We note that even the Λ single-particle energies are not well known experimentally in the sd -shell and higher regions.

Thus we anticipate that the ${}^{19}_{\Lambda}\text{F}$ hypernucleus is an important gate to sd -shell hypernuclear spectroscopy and correspondingly the detailed theoretical investigation of the structure and (K^- , π^-) production rates is necessary. We applied the multi-configuration shell model to the structure study of ${}^{18,19}\text{F}$ and ${}^{19}_{\Lambda}\text{F}$ with the spurious center-of-mass motion being removed. We use conventional ΛN effective interactions derived from the Nijmegen NSC97f potentials. The obtained wave functions are used to estimate the production cross sections in DWIA for the ${}^{19}\text{F}(K^-, \pi^-)$ reactions at the high incident momenta of $p_K = 1.1, 1.5,$ and 1.8 GeV/ c for the first time. The angular dependence of the cross sections for some low-lying states are shown in Fig. 1. In this talk we discuss theoretical aspects of the production cross sections and also the estimates of $M1, E2,$ and $E1$ transition strengths within the low-lying states of ${}^{19}_{\Lambda}\text{F}$.

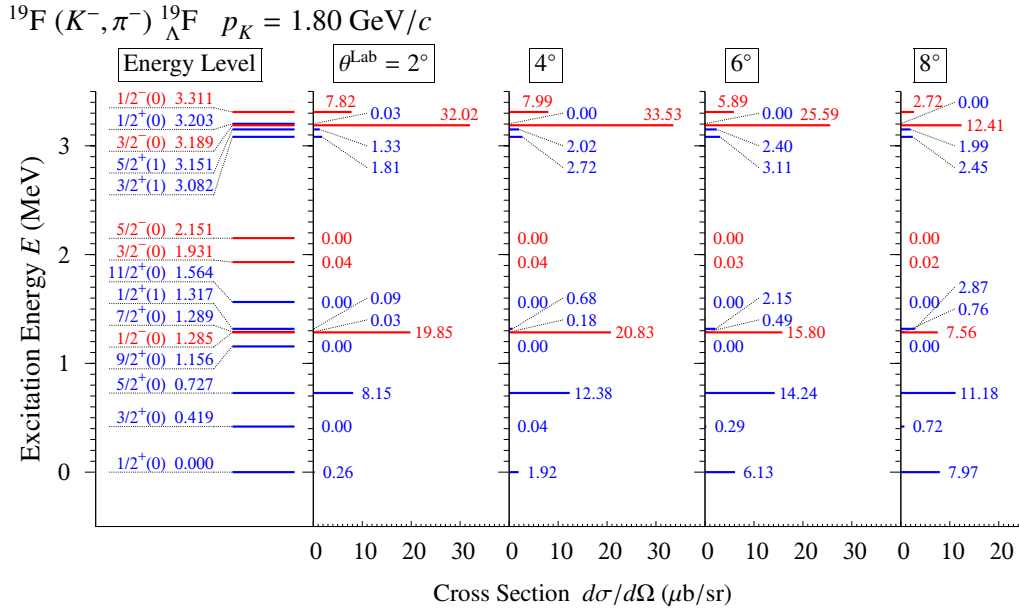


Figure 1: Cross sections of (K^- , π^-) reaction for low-lying energy levels of ${}^{19}_{\Lambda}\text{F}$