$\Lambda(1405)$ photoproduction at SPring-8/LEPS

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The $J^p = \frac{1}{2}^- \Lambda(1405)$ hyperon lies just below $\bar{K}N$ threshold and far below the mass of its $L \cdot S$ partner $J^p = \frac{3}{2}^- \Lambda(1520)$. Its structure has not yet been clearly understood between a unstable $\bar{K}N$ bound state and $L = 1$ $SU(3)$-singlet three quark state coupled with the S-wave $\bar{K}N$ channels. Recent theoretical works of Nacher *et al.* describe that the resonance is generated dynamically by meson-baryon interaction. Their chiral unitary model predicts a drastic change in the decay width and/or mass of the resonance in nuclear medium due to its meson-baryon molecular nature [1]. While a large body of low-energy K^-p scattering data is available, the existing $\Lambda(1405)$ data set is very limited for more detailed analysis. The present status of the $\Lambda(1405)$ thus depends heavily on theoretical arguments. In this regard, a SPring-8 experiment for the $\Lambda(1405)$ photoproduction will elucidate the nature of the $\Lambda(1405)$ and also test competing model predictions. We have measured $\Lambda(1405)$ photoproduction with a liquid hydrogen target. Thanks to complete kinematics of the $p(\gamma, K^+\pi)\Sigma$ reaction, we have measured asymmetric lineshapes of the $\Lambda(1405)$ mass spectra in the $\pi^+\Sigma^-$ and $\pi^-\Sigma^+$ channels. A small time projection chamber (TPC) is now ready for measuring a possible shift in mass or decay width of the $\Lambda(1405)$ in nuclear medium. First results on $\Lambda(1405)$ photoproduction off proton will be presented and discussed in close connection with the $\Lambda(1405)$ photoproduction experiment with the TPC.

References

[1] J.C. Nacher, E. Oset, H. Toki, A. Ramos, Phys. Lett **B455** (1999) 55.