Search for kaon-bound states at the FINUDA experiment

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The FINUDA experiment mainly aims to study the Λ-hypernuclear spectroscopy and its decay processes with the ($K^-_{\rm stop}$, π^-) reaction, where the negative kaon is abundantly provided by the e^+e^- collider DAΦNE as a decay particle of a $\phi(1020)$ meson. The kaon has the momentum as slow as $\sim 127\,{\rm MeV}/c$ and can be stopped in a very thin nuclear target ($0.2\,{\rm mg/cm^2}$), which enables us to have a good momentum resolution for emitted particles from the reaction vertex. The FINUDA spectrometer covers a solid angle larger than $2\pi\,{\rm sr}$, which allows us to detect multi-particles. These features also have advantages to look for a deeply-bound kaonic state formed in the stopped K^- reactions; the most important is to detect a Λ hyperon through the $\Lambda \to p + \pi^-$ decay. We chose 5 kinds of targets (^{6}Li, ^{7}Li, ^{12}C, ^{27}Al and ^{51}V) in the first run (2003–2004). We have succeeded to observe a deeply-bound K^-pp state through the decay into $\Lambda + p$. The Λ and proton clearly showed back-to-back angular correlations for various targets, which suggests the K^-pp system is produced as a fragment in the stopped K^- reaction. The binding energy and the width were obtained from the invariant mass of the $\Lambda + p$ system. In this talk, I will discuss the detail of this decay mode and the prospects in the coming run in 2006.