Study of the Non Mesonic Weak Decay of Λ hypernuclei: recent results from the FINUDA experiment.

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In free space, a Λ particle decays dominantly associated with a pion in the final state as $\Lambda \rightarrow N\pi$. In the case of Λ bound in a nucleus, a Λ hypernucleus, Λ is not only possible to decay as in the free space (mesonic weak decay), but is also able to couple with a nucleon as $\Lambda N \rightarrow nN$ (non-mesonic weak decay, NMWD).

The NMWD gives a unique opportunity to study the weak interaction between baryons, because this strangeness non-conserving process is purely attributed to the weak interaction.

The FINUDA experiment is installed at one of the interaction regions of the DAΦNE ϕ-factory in Frascati (LNF, INFN) and it is mostly dedicated to the high resolution spectroscopy of Λ hypernuclei and to the study of their weak decays .

This studies are performed using the low energy (~16 MeV) K^-, coming from the ϕ decay, to produce Λ-hypernuclei through the $K^-_{stop} + {}^{A}Z \rightarrow {}^{A}_{\Lambda}Z + \pi^-$ reaction.

The aim of this work is to present the recent experimental results obtained from the study of the NMWD of ${}^{5}_{\Lambda}He$, ${}^{7}_{\Lambda}Li$, ${}^{11}_{\Lambda}B$, ${}^{12}_{\Lambda}C$, ${}^{13}_{\Lambda}C$, and ${}^{16}_{\Lambda}O$. Thanks to the excellent capabilities of the FINUDA detector (measurement of the proton spectra with magnetic analysis and production from very thin targets) the spectra feature a precision and low energy threshold (15 MeV) [1] much improved with respect to previous experiments. The measured spectra are quite different from the ones previously reported (${}^{5}_{\Lambda}He$ and ${}^{12}_{\Lambda}C$) [2] as well as form the theoretical predictions (again ${}^{5}_{\Lambda}He$ and ${}^{12}_{\Lambda}C$) [3].

In particular they are peaked at 80 MeV (the energy expected from the weak reaction $\Lambda + p \rightarrow n + p$, broadened by the Fermi motion of the proton) with a low energy tail due to FSI interaction and/or two nucleon absorption processes [4].

[1] FINUDA Coll., M.Agnello et al., Nucl. Phys. A 804 (2008) 151-161.
[2] S. Okada et al., Phys. Lett. B 597 (2004), 249.
[3] G. Garbarino et al., Phys. Rev. C 69 (2004) 054603.
[4] W.M. Alberico and G. Garbarino, Phys. Rep. 369 (2002), 1.