Non-mesonic Weak Decay of Hypernuclei and Nuclear Structure

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Abstract

The non-mesonic weak decay of Λ hypernuclei provides a unique opportunity to the study of the hyperon-nucleon weak interaction[1]. However, the previous studies have been focusing on the elementary $\Lambda\mathrm{N} \to \mathrm{NN}$ process, and investigation on the effects of nuclear structure is rare.

This work studies the nuclear structure effects in non-mesonic weak decay of the Λ-hypernuclei in p-shell in the framework of the symmetry model SU(4)xSU(3)[2]. The mechanism of elementary $\Lambda\mathrm{N} \to \mathrm{NN}$ process is restricted to one π exchange (OPE) with the ΔI=1/2 rule enforced[3]. The decay rates are expressed in the form of a number of analytical factors which represent the contribution from nuclear structure and that from elementary $\Lambda\mathrm{N} \to \mathrm{NN}$ process, respectively. The formalism is applied to the decay of hypernucleus ${}^{12}_{\Lambda}\mathrm{C}$, with a detailed analysis being made on the nuclear structure effects concerning decay rates and branching ratio Γ_n/Γ_p. Discussion is given about the difference between the use of wave function and that of spectroscopic factors in the calculation of decay rates.

References

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