The shrinkage in hypernuclei and the Λ–nucleus interaction

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It has been known for long time that the Λ coupling constants from the relativistic mean field (RMF) models cannot be unambiguously determined from the available data on the Λ single particle levels in hypernuclei [1]. Recent results of the KEK-E419 experiment [2], which revealed distinct reduction of the hypernuclear size caused by the Λ participation, could help to resolve this ambiguity and set bounds on the possible Λ scalar and vector couplings.

In this work, we have studied the influence of the Λ particle on the core nucleus in Λ hypernuclei with the aim to learn more about the Λ–nucleus interaction. Our study is based on the Bertlmann-Martin inequalities [3], which link the r.m.s. radius and the kinetic energy of the 1s orbit to the lowest dipole transition energy. We have extended our previous application [4] of the BM relations to the RMF hamiltonian where the non locality was expressed via the spatial dependent effective mass of the Λ hyperon.

The BM relations appeared to be a useful tool to obtain valuable information on the Λ properties inside the nucleus. Together with the knowledge of the hypernuclear size from the E2 transition measurements, the BM inequalities can make possible to discriminate among various models of the Λ-nucleus interaction and their parametrizations.

References

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