

Meson exchange model with the axial vector a_1 -meson exchange and hypernuclear nonmesonic decay asymmetries

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Recently we have presented the meson-theoretical potential model with the axial vector a_1 -meson exchange for the nonmesonic weak decay [1]. The a_1 -meson ($J^{PC} = 1^{++}$, $m_{a_1} = 1230$ MeV) is a chiral partner of the ρ -meson and has been treated in the meson-pair exchange framework as $\rho\pi/a_1$ and $\sigma\pi/a_1$. The a_1 -meson exchange gives remarkable modifications for the parity-conserving decay potentials ($^{1,3}S \rightarrow ^{1,3}S$ and $^3S_1 \rightarrow ^3D_1$) at short range $r \leq 1$ fm. As a result, the extended meson exchange model of $\pi + 2\pi/\rho + 2\pi/\sigma + \omega + K + \rho\pi/a_1 + \sigma\pi/a_1$ exchanges gives the small and positive intrinsic asymmetry parameter α_Λ 's for $^5_\Lambda\text{He}$, $^{11}_\Lambda\text{B}$ and $^{12}_\Lambda\text{C}$ in agreement with the recent experimental data [2,3]. The calculated decay rates are also consistent with the data within error bars [4,5,6].

We have applied this model and evaluated the decay rates and the asymmetry parameters for the s - and p -shell Λ -hypernuclei. We will report the features of the calculations and implication of inclusion of the chiral pair meson exchanges. Further extensions of the model will also be discussed.

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