On radiative muon capture in hydrogen

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We analyzed [1] the radiative capture of the negative muon in hydrogen using amplitudes derived within the chiral Lagrangian approach [2]. Besides the leading order terms, given by the well-known Rood-Tolhoek Hamiltonian [3], we extract from these amplitudes the corrections of the next order in $1/M$ (M is the nucleon mass). In addition, we estimate within the same formalism also the $\Delta(1232)$ excitation effects and processes described by an anomalous Lagrangian [4]. Using values of the parameters of the model obtained from the analysis of the pion photoproduction [5], which restricts the arbitrariness of the $\pi N \Delta$ and $\gamma N \Delta$ vertices, we find that the model can explain up to half of the discrepancy between the PCAC value g_P^{PCAC} of the induced pseudoscalar constant g_P and of g_P extracted from the recent TRIUMF experiment [6]. If these parameters are allowed to vary independently, the model can describe the high energy part of the experimental photon spectrum reasonably well for the values of $g_P \approx g_P^{PCAC}$.

References

1. E. Truhlík and F.C. Khanna, *On radiative muon capture in hydrogen*, nucl–th/0102006.
2. J. Smejkal, E. Truhlík and F. C. Khanna, *Few–Body Systems* **26**, 175 (1999).
3. H.P.C. Rood and H.A. Tolhoek, *Nucl. Phys.* A **70**, 658 (1965).
4. E. Truhlík, J. Smejkal and F.C. Khanna, *Nucl. Phys.* A **689**, 690 (2001).
5. R. Davidson, N.C. Mukhopadhyay and R. Wittman, *Phys. Rev.* D **43**, 71 (1991).
6. D.H. Wright *et al.*, *Phys. Rev.* C **57**, 373 (1998).