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Radiative M1 Decays of Heavy Flavor Baryons in Effective Mass Scheme

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The M1 radiative transitions of heavy flavor baryons are studied in the framework of Effective Mass Scheme (EMS) within the quark model. The intent of the EMS lies in the fact that the masses of the quarks inside the baryon are modified as a consequence of one-gluon exchange interaction with the spectator quarks and it treats all the quarks at the same footing. The baryon mass can be written as the sum of the constituent quark masses and the spin-dependent hyperfine interaction
among them. We show that EMS can successfully describe the masses and the magnetic moments, transition moments, and radiative decay widths of the lowest-lying singly heavy flavor baryons in a parameter independent way. For the calculation of effective quark masses, the exchange contribution is worked out through interaction terms bij from the recently observed experimental masses for the heavy flavored charm and bottom baryons. We then compute the magnetic and transition moments of ground state JˆP = (1/2)ˆ(+) and JˆP = (3/2)ˆ(+), and(1/2)ˆ(’+) ⟶ (1/2)ˆ(+), (3/2)ˆ(+) ⟶ (1/2)ˆ(+), and (3/2)ˆ(+) ⟶ (1/2)ˆ(’+) heavy flavor charm and bottom baryon states. Finally, we make sturdy model independent predictions for radiative M1 decay widths of heavy flavored baryons. The radiative transitions between the states occur mainly through the M1-type, while there are negligible contributions from E2-type transitions, which are
therefore ignored. We also extend our analysis to the triply heavy charm and bottom baryons.

Summary

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