COVARIANT MESONIC DECAYS OF BARYON RESONANCES AND COUPLED-CHANNEL EFFECTS

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We discuss benchmark results of covariant predictions for mesonic decay widths of baryon resonances from relativistic constituent-quark models including only $\{QQQ\}$ Fock states. For the various π, η, and K decay modes in the light and strange baryon sectors one obtains hadronic decay widths that are generally too small as compared to experimental data [1-4]. Still, the pattern of predictions is characteristic for the particular singlet, octet, and decuplet flavor multiplets and allows, together with the consideration of wave-function properties, for a consistent classification of all established baryons into spin-flavor multiplets [5].

A probable reason for the observed shortcomings of $\{QQQ\}$ constituent-quark models regarding the description of hadronic decay widths lies in the missing explicit coupling to the different mesonic decay channels. Therefore we have aimed at including such mesonic effects by constructing a relativistic coupled-channels quark model. First attempts have been directed to mesons and their hadronic decays [6]. A toy model, for the moment neglecting spin and flavor degrees of freedom, has immediately produced the mesonic resonance states with finite widths (instead of excited bound states with zero widths) as a result of including the decay channel explicitly. This is furnished by coupling the produced meson directly to the constituent quark or antiquark, as suggested by Goldstone-boson-exchange dynamics in low-energy quantum chromodynamics [7,8].

Recent progress in constructing relativistic coupled-channels constituent-quark models for hadrons taking into account all spin and flavor degrees of freedom will be reported.

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