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Decay widths of a $J^P = \frac{3}{2}^-$ N^* resonance obtained from pseudoscalar-baryon and vector-baryon dynamics.

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Exotic hadrons are particles that do not fit the traditional classification of hadrons, and their existence is compatible with our present understanding of Quantum Chromodynamics (QCD), the theory that describes how particles interact through the strong interaction, one of the four fundamental forces of Nature. In QCD, quarks and gluons interact via the strong force; quarks are the fundamental constituents of hadrons, while gluons are the force-carrying particles. The traditionally allowed combinations for hadrons are baryons, or three quark systems (e.g., protons and neutrons) and mesons, or quark-antiquark systems (e.g., pions and kaons). On the other hand, exotic hadrons arise from other combinations of quarks that do not fit the traditional structure of baryons and mesons, such as tetraquarks, formed by two quarks and two antiquarks, pentaquarks, composed of four quarks and one antiquark, or "molecules" of two or more hadrons.

Recently, the generation of certain resonances, such as $N^*(2080)$, has been observed through vector-baryon dynamics. This resonance has isospin $I = \frac{1}{2}$ and spin-parity $J^P = \frac{3}{2}^-$. Its decay width is approximately $\frac{\Gamma_{N^*}}{2} = 70$ (MeV) and its mass is $M_{N^*} = 2071$ (MeV). The interest in studying this N^* resonance lies in its hidden strangeness content and the possibility that it may be partner of one of the P_c states discovered by the LHCb collaboration. Although the spin-parity assignments of $P_c^+(4312)$, $P_c^+(4400)$, $P_c^+(4457)$ are still unknown, numerous studies suggest that they could be interpreted as molecular states. Therefore, we aim to investigate the possible states into which $N^*(2080)$, also denoted as, $P_s(2080)$ in analogy to the P_c states, may decay. To do this, we consider certain conservation laws, effective Lagrangians with specific symmetries and computational methods in order to be able to calculate physical observables, such as decay widths and cross-sections, among others, to obtain a better understanding of the properties of the P_s state.

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