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Dynamical generation of axial-vector mesons

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We present recent results on the dynamical generation of the a_1, h_1, and b_1 axial-vector mesons. We demonstrate the emergence of the a_1 and h_1 mesons from the $\pi\rho$ scattering process, based on the coupled-channel formalism with the $\pi\rho$ and $K\bar{K}^*$ ($\bar{K}K^*$) channels. This is achieved by constructing kernel amplitudes using the effective Lagrangian and computing the coupled integral equation for $\pi\rho$ scattering. By performing the partial-wave expansion, we explicitly show that the $a_1(1260)$ meson arises as a $K\bar{K}^*$ molecular state, generated only by including the $K\bar{K}^*$ ($\bar{K}K^*$) channel. The pole position of the a_1 meson is determined to be at $\sqrt{s_R} = (1170.7 - i173.0)$ MeV. We also investigate four different h_1 mesons by coupling additional channels such as $\eta\omega$ and $\eta\phi$, and find that $h_1(1415)$ is strongly coupled to the $K\bar{K}^*$ and $\eta\phi$ channels, indicating its significant strange quark content. Additionally, we report a novel observation that the b_1 meson has a two-pole structure that arises from $\pi\omega$ scattering, with the interference of these two-pole resonances resulting in the appearance of $b_1(1235)$.

Collaboration

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