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Dynamical $O(4)$ -symmetry in the light meson spectrum within the framework of the Regge approach

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Light mesons tend to cluster near certain values of mass. It is interesting to notice that such a degeneracy can be described using dynamical $O(4)$ -symmetry, like in the hydrogen atom. The meson mass spectrum can be well approximated by linear Regge trajectories of the kind $M^2 = al + bn_r + c$, where l and n_r are angular momentum and radial quantum number, and a, b, c are coefficients. Such a spectrum arises naturally within the hadron string models. Using 2024 data from the Particle Data Group, a fit for $M^2(l, n_r)$ was performed. Our analysis seems to confirm that $a \approx b$ in the light non-strange mesons, i.e., their masses depend on the sum $l + n_r$ as prescribed by the hydrogen-like $O(4)$ -symmetry. Using the semiclassical approximation, we discuss which kind of hadron string models are more favored by the experimental data.

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