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The Inevitable Quark Three-Body Force and its Implications for Exotic States

Tuesday, November 5, 2024 4:00 PM (1 hour)

Three-body nuclear forces are essential for explaining the properties of light nuclei with a nucleon number greater than three. Building on insights from nuclear physics, we extract the form of quark three-body interactions and demonstrate that these terms are crucial for extending the quark model fit of the meson spectrum to include baryons using the same parameter set. We then discuss the implications of our findings for exotic configurations involving more than three quarks, such as the T_{cc} and $\chi_{c1}(3872)$. We find that the quark three-body interactions provide additional repulsion on the order of 10 MeV for the compact configurations of both the T_{cc} and $\chi_{c1}(3872)$. This result, combined with previous calculations, strongly suggests that these tetraquark states are molecular rather than compact states.

Primary author: LEE, Su Hounq (Yonsei University)

Presenter: LEE, Su Hounq (Yonsei University)

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