



Contribution ID: 15

Type: Talk

Exotic T_{bc} tetraquarks from Lattice QCD

Tuesday, 30 July 2024 15:25 (20 minutes)

Research into doubly heavy tetraquarks has become highly relevant, especially with the recent discovery of the doubly charmed tetraquark T_{cc} . In this study, we present a lattice investigation of S-wave $D\bar{B}^{(*)}$ scattering within the isoscalar axial-vector and scalar channels. Both the processes feature the flavor combination $bc\bar{u}\bar{d}$, which could potentially host T_{bc} tetraquarks.

Our calculations were conducted on four different $N_f = 2 + 1 + 1$ MILC gauge ensembles, each with varying lattice spacings and volumes. Utilizing the amplitude analysis method *la* Lüscher, we extracted the $D\bar{B}^{(*)}$ scattering amplitudes from the finite-volume spectra. By examining the light quark mass ($m_{u/d}$) dependence of these amplitudes and extrapolating to the continuum, we explored the behavior of the $bc\bar{u}\bar{d}$ tetraquarks at the physical $m_{u/d}$. Our findings provide evidence for a bound state of the $bc\bar{u}\bar{d}$ tetraquark at the physical $m_{u/d}$ within both the scalar and the axial-vector channels.

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Session Classification: Hadronic and nuclear spectrum and interactions

Track Classification: Hadronic and Nuclear Spectrum and Interactions