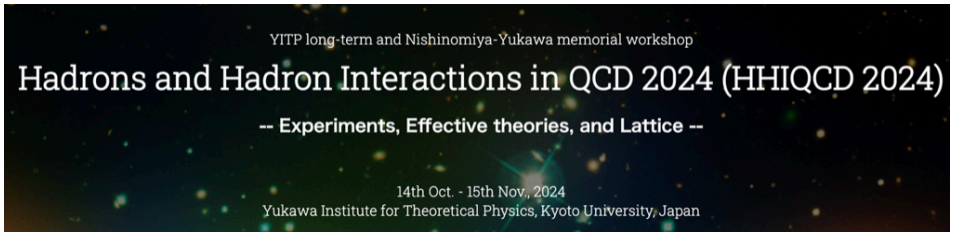

Contribution ID: **87** Type: **3rd week (Nishinomiya-Yukawa symposium)**

Born-Oppenehimer EFT (BOEFT) for quarkonium, tetraquark, hybrids, pentaquarks and doubly heavy baryons

Monday, October 28, 2024 9:10 AM (1 hour)

In this talk I will show how the BOEFT, derived from Quantum Chromodynamics on the basis of scale separation and symmetries, can address XYZ exotics of any composition. We derive the Schr¨odinger coupled equations that describe hybrids,tetraquarks, pentaquarks, doubly heavy baryons, and quarkonia at leading order, incorporating nonadiabatic terms, and present the predicted multiplets. We define the static potentials in terms of the QCD static energies for all relevant cases. We provide the precise form of the nonperturbative low-energy gauge-invariant correlators required for the BOEFT: static energies, generalized Wilson loops, gluelumps, and adjoint mesons. These are to be calculated on the lattice and we calculate here their short-distance behavior. Furthermore, we outline how spin-dependent corrections and mixing terms can be incorporated using matching computations. Lastly, we discuss how static energies with the same BO quantum numbers mix at large distances leading to the phenomenon of avoided level crossing. This effect is crucial to understand the emergence of exotics with molecular characteristics, such as the $\chi c1(3872)$. With BOEFT both the tetraquark and the molecular picture appear as part of the same description. We discuss also some applications to the $\chi c1(3872)$.

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Session Classification: Nishinomiya-Yukawa workshop