



Contribution ID: 289

Type: **Plenary**

Recent developments in LQCD studies on tetraquarks

Monday 17 June 2019 10:30 (30 minutes)

Heavy flavor exotic hadrons, and in particular tetraquarks, continue to challenge our understanding and elude explanation from theory. In this contribution we discuss and review the progress and status in studying doubly heavy tetraquark states with $J^P = 1^+$ on the lattice. In particular, we focus on our recent efforts using 2+1 flavor lattice QCD with pion masses of 164, 299 and 415 MeV at fixed lattice spacing and lattice volume, $L=32$, to study the ground states of the flavor channels $ud\bar{b}\bar{b}$, $ls\bar{b}\bar{b}$ as well as $ud\bar{c}\bar{b}$, with $\ell = u, d$. In our work the heavy quarks are handled using non-relativistic QCD for the bottom and the Tsukuba formulation of relativistic heavy quarks for the charm quarks. Signals for $ud\bar{b}\bar{b}$ and $ls\bar{b}\bar{b}$ tetraquarks are found with binding energies 189(10) and 98(7) MeV below the corresponding free two-meson thresholds at the physical point. This indicates they can decay only weakly. Further evidence for binding is found in the $ud\bar{c}\bar{b}$ channel at the level of 15-61 MeV, close to the electromagnetic stability threshold. Studying the heavy quark mass dependence we find our results closely follow a behaviour argued from phenomenological considerations of the heavy baryon spectrum. First studies of the volume dependence of the determined energy spectrum show tentative hints confirming stability for the $ud\bar{b}\bar{b}$, $ls\bar{b}\bar{b}$ as well as $ud\bar{c}\bar{b}$ channels. Gathering and comparing recent results from the community where possible a consistent picture for doubly heavy tetraquarks is emerging.

Authors: FRANCIS, Anthony Sebastian (CERN); HUDSPITH, Renwick James (Uni Mainz); LEWIS, Randy (York University); MALTMAN, Kim (York University)

Presenter: FRANCIS, Anthony Sebastian (CERN)

Session Classification: Plenary

Track Classification: Hadron Spectroscopy and Interactions