

Near-Threshold Doubly Heavy Tetraquark States

Laura Cui

Montgomery Blair High School

Mentor:

Dr. Thomas Cohen

University of Maryland Department of Physics

1 Abstract

Understanding the structure of exotic hadrons remains one of the major challenges in hadronic physics. While advances in high energy experiments have provided compelling evidence for the existence of a variety of exotic states, no consistent theoretical description of these states has emerged. This paper focuses on tetraquark states that contain two heavy quarks or a heavy quark-antiquark pair, and for which only one quantum state exists. We present a description of these states as a two-body problem in quantum mechanics. By parameterizing the mass of the heavy quark, we showed that the weakly bound property of such states is a direct consequence of mass scale separation in the semi-classical limit of quantum chromodynamics. Our results may have connections to recently discovered particles such as the $X(3872)$ which are thought to contain a $c\bar{c}$ pair.