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Chiral Quirkonium Decays

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We calculate the two-body decay rates of “quirkonium” states formed from quirks that acquire mass solely through electroweak symmetry breaking. We consider $SU(N)_{ic}$ infracolor with two flavors of quirks transforming under the electroweak group (but not QCD) of the Standard Model. In one case, the quirks are in a chiral representation of the electroweak group, while in the other case, a vector-like representation. The differences in the dominant decay channels between “chiral quirkonia” versus “vector-like quirkonia” are striking. Several chiral quirkonia states can decay into the unique two-body resonance channels WH , ZH , $t\bar{t}$, $t\bar{b} / b\bar{t}$, and $\gamma+H$, which never dominate for vector-like quirkonia. Additionally, the channels WW , WZ , ZZ , and $W+\gamma$, are shared among both chiral and vector-like quirkonia. Resonances of dileptons or light quarks (dijets) can dominate for some vector-like quirkonia states throughout their mass range, while these modes never dominate for chiral quirkonia unless the decays into pairs of gauge or Higgs bosons are kinematically forbidden.

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