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Diquark scalar production of a vectorlike quark pair at the LHC

We study the discovery potential of LHC experiments for resonantly produced vectorlike quarks (χ), when the s-channel resonance is an ultraheavy diquark scalar particle (S_{uu}) of mass in the $7 - 8.5$ TeV range. Given that the S_{uu} resonance can be reconstructed when both W^+ bosons decay hadronically, we focus on the 6-jet final state arising from the $pp \to S_{uu} \to \chi\chi \to (W^+b)(W^+b)$ process. The signal selection study is done by employing Machine Learning algorithms to construct a multidimensional signal-from-background discriminator. Our results indicate that ATLAS or CMS searches in the above 6-jet final state with a luminosity of 3000 fb^{-1} may discover or rule out a diquark scalar of mass near 8 TeV even when its yukawa coupling to up quarks is as small as $y_{uu} \approx 0.2$. We also discuss preliminary results on the 4-jet final state of $pp \to S_{uu} \to u\chi \to u(W^+b)$.

Secondary track

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