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Discovering heavy colored vectors at the LHC

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We performed a study of the LHC discovery reach on composite fermions (top and bottom Kaluza- Klein's) and composite gluon (KKg). We found that the KKg phenomenology is strongly dependent on the ratio between its mass and those of the heavy fermion resonances. When the KKg is below the threshold for the production of a heavy fermion, KKg decays almost completely to top pairs. Until now, this first scenario is the only one studied in the literature on the KKg search at the LHC. There is a high and difficult to reduce QCD background that makes difficult the KKg discovery at the LHC. In the opposite scenario where KKg is heavier than composite fermion pairs, the KKg total decay width becomes too large (O(TeV)) to distinguish its resonance from the background. On the other hand, the intermediate scenario where KKg is heavier than a composite fermion but lighter than heavy fermion pairs seems to be very promising for the KKg search at the LHC. This scenario seems to be also the best motivated one according to the hints from the electroweak data, flavor observables and to naturalness arguments. We suggest the KKg decays into a top (bottom) and its heavy partner as the best search channels both for the KKg and the heavy fermions. We found, indeed, that the presence of heavy fermion resonances only in the signal turns out to be very effective to reduce backgrounds.

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