



Contribution ID: 336

Type: **not specified**

## Four-top quark signatures through the lens of color-octet scalars

*Friday 27 August 2021 23:15 (20 minutes)*

We reinterpret two recent LHC searches for events containing four top quarks ( $t\bar{t}t\bar{t}$ ) in the context of supersymmetric models with Dirac gauginos and color-octet scalars (sgluons). We explore whether sgluon contributions to the four-top production cross section  $\sigma(pp \rightarrow t\bar{t}t\bar{t})$  can accommodate an excess of four-top events recently reported by the ATLAS collaboration. We also study constraints on these models from an ATLAS search for new phenomena with jets and missing transverse energy ( $E_T^{\text{miss}}$ ) sensitive to signals with four top quarks. We find that these two analyses provide complementary constraints, with the jets +  $E_T^{\text{miss}}$  search exceeding the four-top cross section measurement in sensitivity for sgluons heavier than about 800 GeV. We ultimately find that either a scalar or a pseudoscalar sgluon can currently fit the ATLAS excess in a range of reasonable benchmark scenarios, though a pseudoscalar in minimal Dirac gaugino models is ruled out. We finally offer sensitivity projections for these analyses at the HL-LHC, mapping the  $5\sigma$  discovery potential in sgluon parameter space and computing exclusion limits at 95% CL in scenarios where no excess is found.

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**Session Classification:** Supersymmetry: Models, Phenomenology and Experimental Results

**Track Classification:** Supersymmetry: Models, Phenomenology and Experimental Results