



Does the Top Quark embrace its Antipode?

A Search for Scalars, Pseudoscalars and $t\bar{t}$ Bound States

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Auditorium & Webcast 16:00 h

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I will present a search for heavy pseudoscalar or scalar bosons decaying to a top quark pair ($t\bar{t}$) in final states with one or two charged leptons, using 138 fb^{-1} of proton-proton collisions at $\sqrt{s} = 13 \text{ TeV}$ recorded by the CMS experiment. The invariant mass of the reconstructed $t\bar{t}$ system and variables sensitive to its spin state are used to discriminate against the standard model $t\bar{t}$ background and to infer properties of spin quantum numbers. An excess of the data above the background prediction, as modeled using perturbative QCD only, is observed with a significance of above five standard deviations.

I will discuss three possible hypotheses to interpret the excess which is located close to the $t\bar{t}$ production threshold: by scalar production, pseudo-scalar production or by the existence of a color singlet pseudoscalar $t\bar{t}$ bound state, as predicted in a simplified model of nonrelativistic QCD. For the first two hypotheses, I will outline upper limits on the coupling of pseudoscalar or scalar bosons to top quarks in a mass range of 365–1000 GeV and relative widths of 0.5–25%. For the third scenario, I will present an extracted cross section of 7.1 pb with an uncertainty of 11%.

