

## Highlight on Toponium «In Search of Spin-O Resonances Decaying to Top Quark-Antiquark Pairs » Afiq Anuar, DESY Hamburg

The CMS Collaboration has recently publicized a search for heavy pseudoscalar or scalar bosons decaying to a top quark pair in final states with one or two charged leptons, using 138 fb<sup>-1</sup> of proton-proton

collisions at  $\sqrt{s} = 13$  TeV. In this search, an excess of the data above the background prediction, as modeled using perturbative quantum chromodynamics only, is observed with a significance of above five standard deviations.

In my presentation, I will discuss the properties of the excess as established within the scope of the search. This includes its position, which is close to the top pair production threshold, as well as its spin quantum numbers. In addition, I will discuss interpretations of the data in terms of a  ${}^{1}S_{0}{}^{[1]}$  bound state of top quark pairs, whose modelling is extremely challenging despite its formation being a prediction of the standard model, and in terms of a generic spin-0 boson whose resonant production interferes with the top pair continuum. I will also discuss this result in a wider context, in particular the interplay between it and existing experimental measurements.

November 7, 2024 Amphi Dirac, 2 pm