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Measurement of the top quark Yukawa coupling from $t\bar{t}$ kinematic distributions in the dilepton final state

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An extraction of the top quark Yukawa coupling (Y_t) from top quark pair production in the dilepton final state using proton-proton collisions recorded by the ATLAS experiment during LHC run 2 & 3 is presented. Corrections from a Higgs boson exchange between the top quark and top anti-quark can produce large modifications to differential distributions near the energy threshold of $t\bar{t}$ production. The kinematic distributions sensitive to these modifications are the invariant mass ($m_{t\bar{t}}$) of the $t\bar{t}$ system and the rapidity difference ($\Delta y_{t\bar{t}}$) between the top quarks. This analysis aims to constrain Y_t indirectly using the kinematic distributions of $t\bar{t}$ pair events using the dilepton final states of $e\bar{e}$, $\mu\bar{\mu}$ and $e\bar{\mu}$ channels.

In this talk, the current status of the analysis will be presented, as well as future plans. An event selection scheme has been implemented to optimally select for $t\bar{t}$ events while suppressing background contributions. Although it is possible to reconstruct top quarks, this would introduce large resolution effects and additional systematic uncertainties due to the sensitivity to the reconstruction of the missing transverse momentum. As a result, the kinematic distributions are based on proxy observables that are sensitive to Y_t , namely the $m_{t\bar{t}}$ and $\Delta y_{t\bar{t}}$. These proxy observables are constructed using the two leptons and the two b-tagged jets. A profile likelihood fit is then implemented to extract a blinded estimation of Y_t using Asimov data including a limited set of systematic uncertainties.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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