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Statistical correlations impacting a top quark mass measurement in 13 TeV proton-proton collision data from the ATLAS detector

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The top quark is the heaviest particle in the standard model and reducing the uncertainty of the top quark mass directly speaks to/ affects precision tests of the consistency of the standard model, where breaks from this consistency would point to the existence of more massive particles. Since the top quark decays before hadronizing, either the kinematic properties of the decay products or measurements of the rate of the top quark production have been used to measure the mass of the top quark. The majority of measurements consider various decay modes of the W boson with no specification on the decay of the b-quark when utilizing the kinematic properties of the decay products. These measurements are predominantly limited by uncertainties related to the reconstruction of jets. However, there is a top quark decay mode which are largely independent of the aforementioned uncertainty but require large amounts of data due to their low production rate. This decay mode includes a J/ψ meson originating from a b-hadron and a semi-leptonic decay of the W boson. The invariant mass of the J/ψ meson and lepton is sensitive to the top quark mass. This paper describes a maximum likelihood approach to extract the top quark mass from a probability density function, pdf, while studying the impact of the correlations between each of the pdf parameters.

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Yes

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

PhD

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