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Understanding the J/Psi background in top quark events using proton-proton collision data at a centre-of-mass energy of 13 TeV in ATLAS

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High precision measurements of the top quark mass have been widely sought after since the discovery of the top quark. This mass is correlated with the top quark's decay products and the best current measurements are predominantly limited by uncertainties related to the reconstruction of jets. However, there are top quark decay signatures which are largely independent of the aforementioned uncertainty but require large amounts of data as they are produced at a much lower rate than the usual signatures. One of these decay signatures include a J/Psi meson originating from a B-hadron. The ATLAS detector cannot identify the exact origin of these J/Psi mesons and therefore, background J/Psi mesons contribute and negatively impact the mass measurement. However, these background J/Psi contributions can be separated from signal J/Psi mesons by exploiting the mass of a J/Psi meson and the unique displaced decay vertex feature of B-hadrons. This paper describes a data-driven technique to determine the contributions from signal and background J/Psi mesons and highlight kinematic regions which limit the contamination of background J/Psi mesons in preparation for the large dataset that will be available at the end of the next data-taking period.

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

Yes

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

MSc

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