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Measurement of the leptonic charge asymmetry in \ttw production using the trilepton final state in proton-proton collisions at centre-of-mass energy of 13 TeV using the ATLAS experiment

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A measurement of the leptonic charge asymmetry (A_C^ℓ) in top quark pair production in association with a, W boson ($t\bar{t}W^\pm$) is presented using the trilepton final state. The A_C^ℓ is sensitive to new physics beyond the standard model, such as the axigluon and as a result, a measurement of the A_C^ℓ could prove useful in searches for new physics. The data set used in this measurement consists of proton-proton collisions at the Large Hadron Collider (LHC) at a $\sqrt{s}$ = 13 TeV, which was recorded using the ATLAS experiment and corresponds to an integrated luminosity of 139 fb^{-1}.

An event selection scheme was put in place to optimally select for $t\bar{t}W^\pm$ events in the three-lepton final state while suppressing background events. To calculate the A_C^ℓ the pseudorapidities of the two leptons that decay from a top quark and a top anti-quark are required. As such lepton-top association was implemented using machine learning which correctly identified leptons decaying from top quarks in 72% of $t\bar{t}W^\pm$ events.

The extraction of the A_C^ℓ is done using a profile likelihood fit to the event yields in multiple regions defined in terms of the positive and negative difference of absolutes between the pseudorapidities of the charged leptons from top quark and top anti-quark decays. A preliminary blinded result, which includes a comprehensive set of systematic uncertainties, of the leptonic charge asymmetry is given by A_C^ℓ = -8% $\pm$ 17%. The dominant source of uncertainty is due to the limited size of the data set. Further data acquired at the LHC over the next decade should reduce the impact of the dominant uncertainty of the measurement of the A_C^ℓ in $t\bar{t}W^\pm$.

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

Yes

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

PhD

Primary authors: GARVEY, Cameron; KEAVENEY, JAMES (University of Cape Town); YACOOB, Sahal (University of Cape Town)

Presenter: GARVEY, Cameron

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