Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **383** Type: **Invited Speaker / Conférencier(ère) invité(e)**

High Energy Physics at Low(er) Energies: Precision Measurements in Top Quark Physics at $\sqrt{s}$ = 5.02 TeV

Friday 13 June 2025 09:00 (30 minutes)

Meet the top quark, the heavyweight champion of the subatomic world, tipping the scales at a mass comparable to a single tungsten atom. Unlike its lighter counterparts, this elusive particle has a flair for the dramatic by boasting the shortest lifespan of all quarks and the unique ability to be measured as a "free" quark, for a fleeting moment, before decaying. With the discovery of the Higgs boson through proton-proton collisions at the Large Hadron Collider (LHC) in 2012, and no sign of any physics beyond the Standard Model (SM), measurements of the top quark provide an alternate approach to understanding and testing the SM. This talk will present two measurements of the top quark at a centre-of-mass energy of 5.02 TeV, using 257 pb^{-1} of proton-proton collision data collected by the ATLAS detector. The first is a $t\bar{t}$ (top-quark pair production) cross-section measurement that is used to improve our understanding of the internal structure of the proton. The second is a search for t-channel single-top-quark production. The pair production cross-section was measured individually in both the dilepton and single-lepton channels of the $t\bar{t}$ decay before being combined. The measurement in the single-lepton channel is also currently the most precise measurement of the top-quark pair production cross-section by the ATLAS Collaboration to date. The t-channel cross-section is measured in the semi-leptonic decay of the top quark and is the first observation of this process at a centre-of-mass energy of 5.02 TeV.

Keyword-1

Top quark physics

Keyword-2

Physics with ATLAS

Keyword-3

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Session Classification: (PPD) F1-1 Particle physics at colliders II and muon g-2 | Physique des particules aux collisionneurs II et muon g-2 (PPD)

Track Classification: Technical Sessions / Sessions techniques: Particle Physics / Physique des particules (PPD)