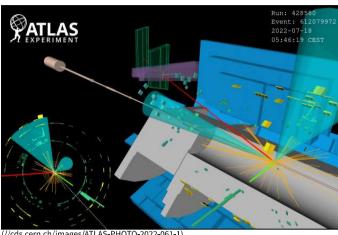
• ୍ଦି ଓ -Now-ଶୋକ --Noews ର Topic: Physics ୍ କ ହି ୍ ତ → ରେତ୍-କ

Voir en <u>français (/fr/news/news/physics/atlas-moves-top-gear-run-3)</u>

ATLAS moves into top gear for Run 3

In their first Run 3 results, the ATLAS collaboration measured two Standard Model processes: the production of Z bosons and top-quark

16 DECEMBER, 2022 | By ATLAS collaboration (/authors/atlas-collaboration)



 $Event \ display \ of \ a \ pair \ of \ top \ quarks \ decaying, \ recorded \ in \ the \ ATLAS \ detector \ on \ 18 \ July \ 2022. \ (Image: CERN) \ detector \ on \ 2022. \ detecto$

After over three years of upgrade and maintenance work, the <u>Large Hadron Collider</u> (/about/accelerators/large-hadron-collider) began its third period of operation $\underline{(/news/news/cern/third-run-large-hadron-collider-has-successfully-started)} \, (Run \, 3) \, in \, July \,$ $2022. \, Since then, the world's \, most \, powerful \, particle \, accelerator \, has \, been \, colliding \, protons$ at a record-breaking energy of 13.6 TeV. The <u>ATLAS (/science/experiments/atlas)</u> collaboration has just released its first measurements

(https://cds.cern.ch/record/2842916/files/ATLAS-CONF-2022-070.pdf) of these record collisions, studying data collected in the first half of August 2022.

The researchers measured the rates of two well-known processes: the production of topquark pairs and the production of a <u>Z boson (/science/physics/z-boson)</u>, which proceed through strong and electroweak interactions, respectively. The ratio of their cross sections is sensitive to the inner structure of the proton, and their measurement sets constraints on the relative probabilities that reactions are initiated by quarks and gluons.

These early measurements also validate the functionality of the ATLAS detector and its reconstruction software, which underwent many improvements in preparation for Run 3.

Physicists focused on Z-boson decays to electron and muon pairs, and on top-quark decays to a W boson (/science/physics/w-boson-sunshine-and-stardust) and a jet - collimated sprays of particles – originating from a bottom quark. The W boson subsequently decays into one electron or muon and an invisible neutrino. As the analysis uses very early Run 3 $data, physicists\ relied\ on\ preliminary\ calibrations\ of\ the\ leptons, jets\ and\ luminosity.\ These$ were derived promptly after the first data became available.

ATLAS measured a top-quark pair to Z boson production ratio that is consistent with the Standard Model prediction within the current experimental uncertainty of 4.7%.

The calibration and corresponding uncertainties will be improved as more data is processed. Future updates of the calibration will allow researchers to measure the cross sections with greater precision.

To validate their results, physicists performed a series of cross-checks. These included measuring the ratio of the cross section each time the LHC was injected with a new fill of

More analyses using the Run 3 data will follow, exploiting the unprecedented energies and

Read more on the ATLAS website. (https://atlas.cern/Updates/Briefing/First-Run3-

LHC Run 3 (/tags/lhc-run-3) ATLAS (/tags/atlas)

Related Articles

(/news/news/accelerators/accelerator-report-crescendo lhc-following-firststable-scascendo-lhcfollowing-firststable-beams-68-tev)

(/news/news/accelerators/accelerator elerators/acceler report-preparing-upcoming-incpreparingupcoming-lhcrestart)

View all news)

restart)ator-report-(/news/news/accelerators/beam-gas-(/news/news/acc curtain-new-instrument-lnc-run-3) elerators/beamgas-curtain-newinstrument-lhcrun-3)

Also On Physics

nuclear-clock)

(/news/news/physics/lhc-experiments-see-first-evidence-rarehiggs-boson-decay)

> experiments-see-first-evidencerare-higgs-boson-decay)

(/news/news/physics/lhc-

(/news/news/physics/isolde-takes-solid-tick-forward-towardsnuclear-clock)

takes-solid-tick-forward-towards-

(/news/news/physics/probingnature-higgs-boson) (/news/news/physics/isolde-

(/news/news/ph fundamental-sy higgs-boson)

0

View all news)

FOLLOW US

CERN & YOU

-) Contact us) Getting here
-) Knowledge transfer
- Visits

) Careers

-) CERN's neighbours
-) Privacy policy
- Esplanacle des Particules 1
 ACCEPTONIX NECESSARY) Partnerships ACCEPTALL

) CERN & Society Foundation

) Doing business with CERN

Privacy policy (/privacy) Cookie documentation (/cookies)

) Cookies Consent Management

 $\bullet \quad \uparrow \quad \textcircled{\blacksquare} \bigcirc \rightarrow \quad \bullet \quad \textcircled{\blacksquare} \bigcirc \rightarrow \quad \rightarrow$

Switzerland

Sign in (/user/login) Directory (//cern.ch/directory)

) Alumni

Copyright (https://copyright.web.cern.ch/) © 2023 CERN

· 🛱 💠 💠 💿 🖑 🦹

• (3D) • • • • • • • • •

→ • •

→ 🖺 •

· 🛱 💠 💠 💿 🖑

!■ ^

· 🛱 💠 💠 💿 🖑

· 🛱 û û û 🌖 🐧

 \rightarrow \bigcirc \bullet \bigcirc \bullet \bigcirc \bullet \bigcirc

· ((A) → · (B) · (A) ·