



AR Scene: Adobe Aero app required, only works on iOS (beta version for very new Android)

Scan the QR code above, then scan a flat vertical surface to calibrate.

Tap the calibration target on the poster that appears. There are 3 buttons on the left of the poster. Click one, then pan clockwise all the way around to see the scene that appears.

Upgrading the ATLAS detector at the LHC: New Small Wheels

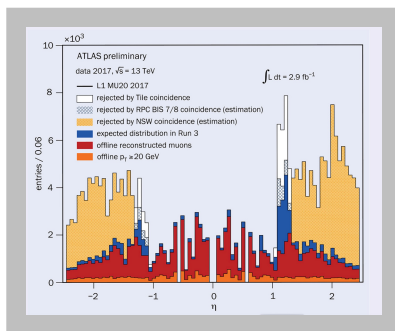
Callum McCracken and Oliver Stelzer-Chilton
Both affiliated with TRIUMF and UBC

The New Small Wheels

The largest phase-1 upgrade project for the ATLAS muon system is the replacement of the first station in the forward regions, with the so-called New Small Wheels (NSW).

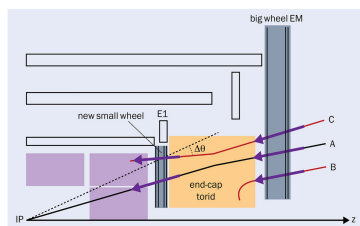
The NSWs have eight layers each of Micro Pattern Micromegas and small-strip Thin Gap Chambers (sTGC), for a total active surface of >2500 square meters.

This represents the first system with such a large size based on Micromegas and sTGCs. The NSWs should reduce the endcap fake rate by ~90% (as in figure).



Reducing The Fake Rate

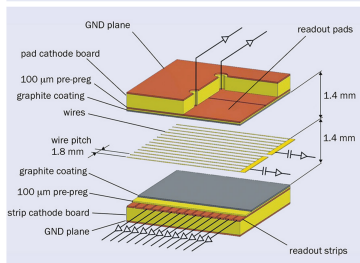
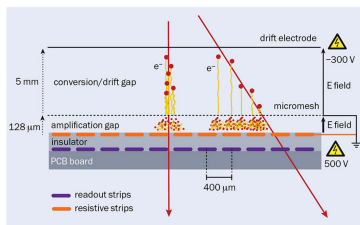
The NSWs will allow for reconstruction of muon segments in the inner station. Requiring coincidence with the big wheels will significantly reduce the fake muon rate (especially for fakes of type B in fig. below).



The NSW Detectors

MicroMegas: top fig., primarily for tracking

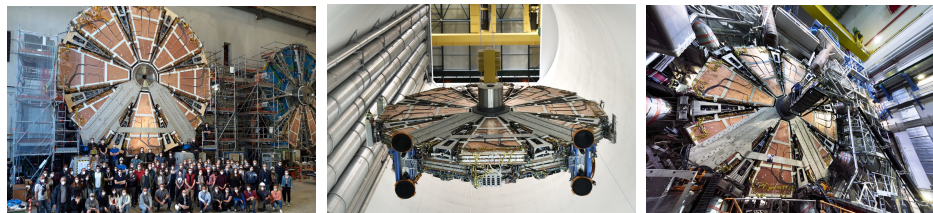
sTGC: bottom fig., primarily triggering



Top left: the TRIUMF ATLAS group with an sTGC detector half gap.

Top middle: sTGCs were assembled at sites in Canada, Chile, China, Russia, and Israel into groups of 4 chambers (left), then sent to CERN for assembly into wedges (right).

Top right: TRIUMF students helping with the wiring of the NSWs at CERN.



Bottom left: group photo with the completed NSW A at CERN Building 191.

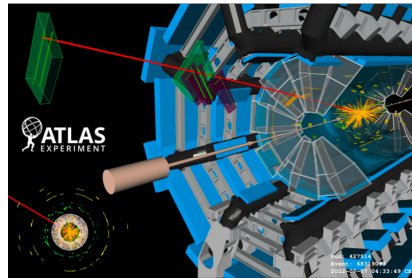
Bottom middle: NSW A being lowered into the ATLAS cavern.

Bottom right: NSW A during installation into the ATLAS detector.

Run 3 NSW Data

The wheels are now installed and collecting run 3 data. Updated fake rate estimates are coming soon!

Fig: the New Small Wheels are now visible on ATLAS event displays.



What's Next: ITk Upgrade

Need increased performance, granularity, and radiation hardness for the upcoming HL-LHC.

ITk: Inner Tracker, new all-silicon detectors for high-precision tracking near interaction point, installation after run 3.



Fig: Tyman from the TRIUMF ATLAS group, holding an ITk detector segment.

Discovery, accelerated