

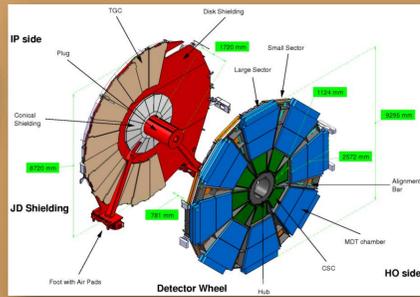
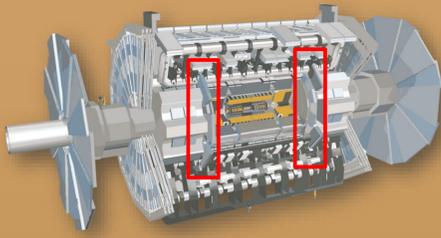
# Small Strip Thin Gap Chambers (sTGC) for the New Small Wheel (NSW) at ATLAS

Xinfei Huang, 16 Sep 2021

(on behalf of the ATLAS Muon Collaboration)



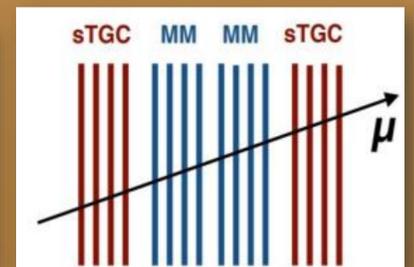
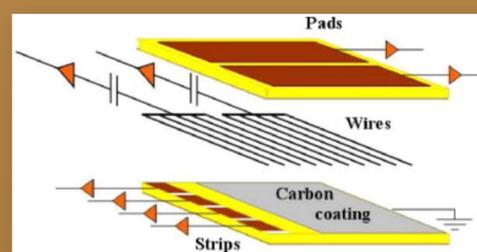
## New Small Wheel



- The two NSWs (~10 meters in diameter) replace the Small Wheels to meet the following requirements:
  - Single layer positional resolution better than  $100\mu\text{m}$  at both low and high luminosity
  - A tracking angular resolution of better than  $1\text{mrad}$
  - The online track segment reconstruction efficiency of more than 95%
- sTGC: 350,000 channels, 192 chambers
- Micromegas: 2 million channels, 128 chambers

## sTGC Muon Detector

- Multi-wire proportional chamber
- Structure
  - A plane of  $50\mu\text{m}$  gold-plated tungsten wires with a  $1.8\text{mm}$  pitch
  - Two cathode planes ( $1.4\text{mm}$  from the wires) consist of  $100\mu\text{m}$  thick G-10 planes covered with graphite-epoxy mixture
  - 55:45  $\text{CO}_2$ :Pentane gas mixture fills in between the planes.
- Characteristics
  - Per channel capacitance:  $200\text{pF} \sim 3\text{nF}$  (pad),  $100\text{pF} \sim 200\text{pF}$  (strip)
  - Signal per minimum ionizing particle hit:  $1.5\text{pC}$

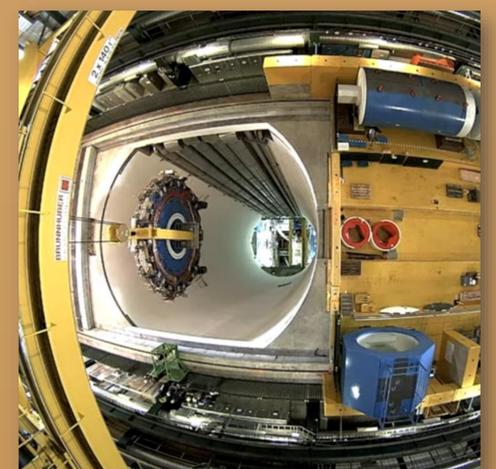


## Front-End Electronics



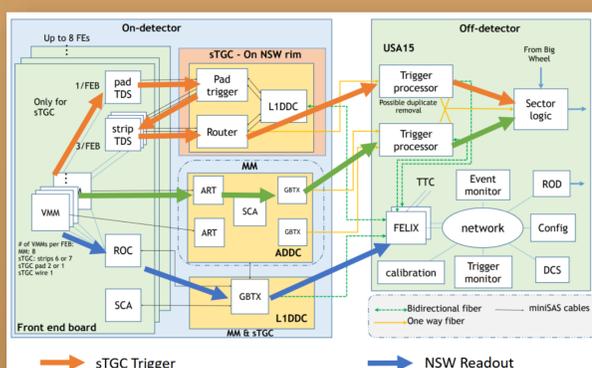
- 768 strip FEB, 768 pad FEB
- VMM: Analog amplifier & shaper, peak detector, discriminator
- ROC: Read Out Controller, Clock, TTC distribution, trigger matching & event building
- SCA: Slow Control Adapter, monitoring & calibration
- TDS: Fixed latency trigger data serializer

## Current Status of NSW

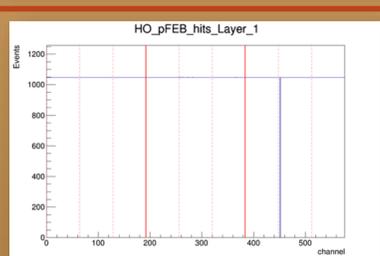


New Small Wheel A on 12 July 2021, being lowered into the ATLAS experiment, in place of the Small Wheel A.

## Trigger and Readout Chains

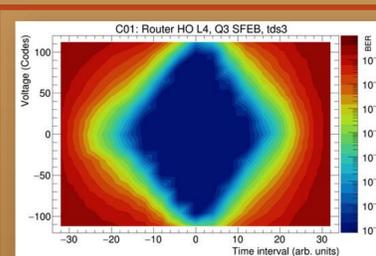
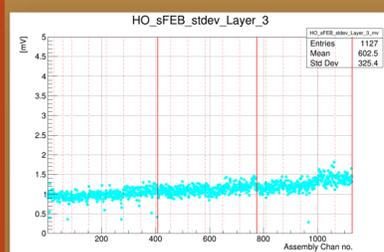


- Trigger commissioning tests the connectivity and data quality of all trigger links.
- Readout commissioning tests sTGC's performance such as baseline, pulse hits, and noise.



Pulse test. There are a few (three) individual dead channels, which is considered acceptable.

Baseline noise. The baseline voltage is between  $150\text{mV}$  to  $200\text{mV}$ . Noise under  $5\text{mV}$  is considered acceptable.



Trigger link stability eye diagram. Its width and sharpness show the quality of the data transmission.



New Small Wheel C on 15 Sep 2021. The commissioning is scheduled to finish before 4 Oct 2021. It will be lowered into ATLAS cavern soon after, to replace the Small Wheel C.