ATLAS ITk Tracking and Readout Performance

ATLAS Simulation Preliminary — ITk Layout: 23-00-03

- Reduced radius of innermost layers:
  - Barrel pixel layer (Layer 0) 39 mm → 34 mm
  - End-cap Rings (Ring Layer 0) 36 mm → 33.2 mm
- Adopted:
  - Planar sensors with 50×50 μm^2 pixels (3D sensors with 25×100 μm^2 pixels in Layer 0 and 50×50 μm^2 in Ring Layer 0)
  - Quads modules with 4 chips bump-bonded to planar sensor (triplets in Layer 0)
- Reoptimized ring positions and increased clearances for easier integration
- Reduced number of barrel staves (16 →12)
- Improved material description

Tracking efficiency
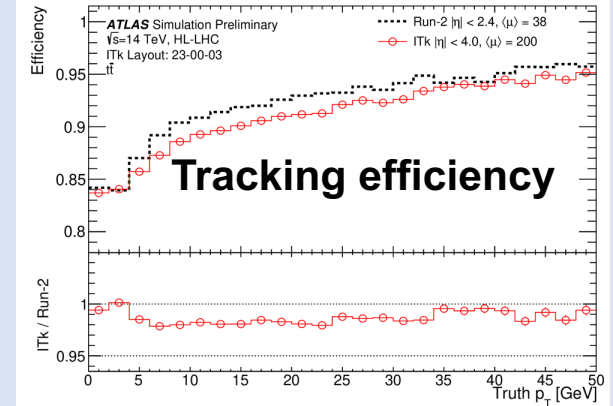
- **Compare performance in tt̄ events with 200 pileup to Run 2 Inner Detector with average pileup of 38**
- **Excellent performance achieved by ITk**

- Developed a dedicated algorithm to evaluate data rate and ensure achievability of 1 MHz L0 trigger rate

ATLAS ITk Simulation Preliminary — ITk Layout: 23-00-03, tt̄, ⟨μ⟩=200, with ToT
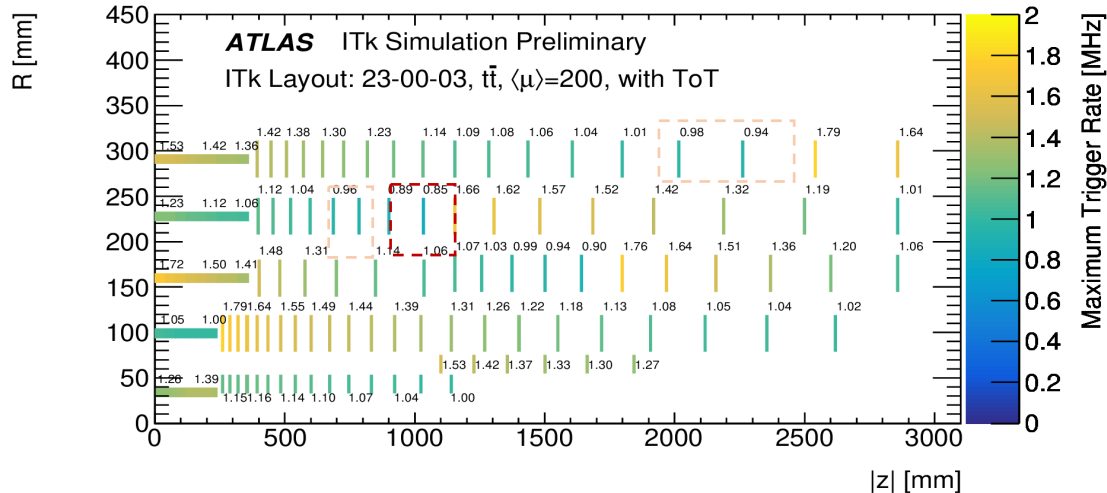
Conclusions:
- A few barrel and end-cap rings are just below 1 MHz rate
- Two Layer-3 end-cap rings miss the target by >10%

Handles to recover the 1 MHz rate:
- Increasing pixel threshold to 2.5 ke (7-15% increase in rate)
- Dropping ToT from the output stream (20-60% increase but disfavoured due to loss of info)

b-tagging

ATLAS Simulation Preliminary — √s = 14 TeV, ⟨μ⟩=200, tt̄ — MV2 — ITk Layout: 23-00-03