L1Track: a Fast Level 1 Track Trigger for the ATLAS High Luminosity Upgrade

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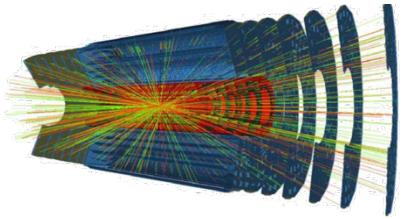


The Challenge:

- Collecting efficiently physics events with ATLAS at the HL-LHC
  - 7.5×10^{34} Hz/cm^2 inst. Luminosity
  - Pile-up <μ>~200 events
- Hardware Trigger Selection:
  - L0: 1 MHz/6μs
  - L1: 400 KHz/24μs

Trigger flexibility is essential

What selections?

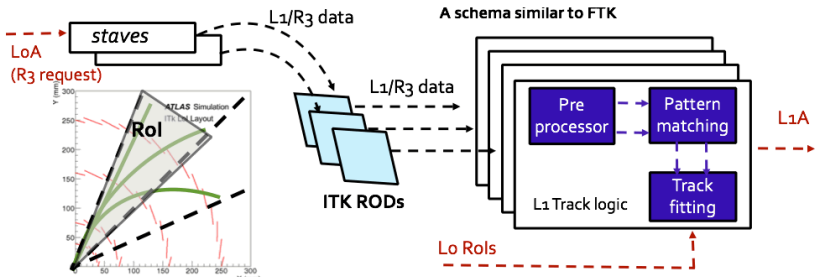
Track reconstruction at L1?

- Is it possible within the 24μs budget?
  - ~[638 (Pixel)+740 (strip)] Mch.
- Goals:
  - ~×5 Background reduction
  - ≳95% signal efficiency

⇒Need track reconstruction for $p_T \geq 4$ GeV

What we like most to build: fast and complicated!

L1Track Challenges



- Read-out:
  - Can data be read-out off-detector fast enough?
  - Full detector?
  - Regional?
- Processing:
  - Can we exploit already developed approaches (e.g. FTK)?
  - Faster and more complex→scalability?
- Performance:
  - is the physics performance sufficient/worth the technical and financial effort?