ID Trigger Task:
- To rapidly and accurately reconstruct the charged particle tracks for an efficient triggering of final state objects

Challenge:
- Large centre-of-mass energy, luminosity and number of proton-proton interactions (pileup), increased in Run 2 to 13 TeV, $2 \cdot 10^{34} \text{ cm}^{-2} \text{s}^{-1}$ and up to ~80 respectively

Components:
- Insertable B-Layer (IBL)
- Pixel Detector (Pixels)
- Silicon Microstrip Detector (SCT)
- Transition Radiation Tracker (TRT)
THE ID TRIGGER SYSTEM

- The High Level Trigger (HLT):
  - Uses software based tracking algorithms to trigger on interesting events
  - Less than 1 kHz output rate, with an average decision timing of ~200ms

- 2 tracking algorithms
  - Fast Tracking - trigger specific pattern recognition algorithm
  - Precision Tracking - uses aspects of offline tracking

- Hadronic tau trigger and b-jet tracking use multiple stage tracking process
  - Taus adopt a two stage system that uses combination of Fast and Precision Tracking
  - B-jets adopt Multi-Stage Tracking strategy

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ATLAS Inner Detector trigger performance

21st IEEE Real Time Conference, Williamsburg 9 - 15 Jun 2018
RUN 2 PERFORMANCE RESULTS

- Tracking efficiency are computed with respect to the well reconstructed offline tracks for different trigger signatures

- ID trigger continues to perform well at high luminosity and pileup in 2018 and has significantly improved efficiency with respect to the algorithms running in 2017

- Very high muon efficiency for whole range of \( p_T \) values, well above 99% for both Fast Tracking and Precision Tracking

- Efficiencies well above 99% even at high muon <\( \mu \) (pileup) values reached with 2018 data

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