End of year updates

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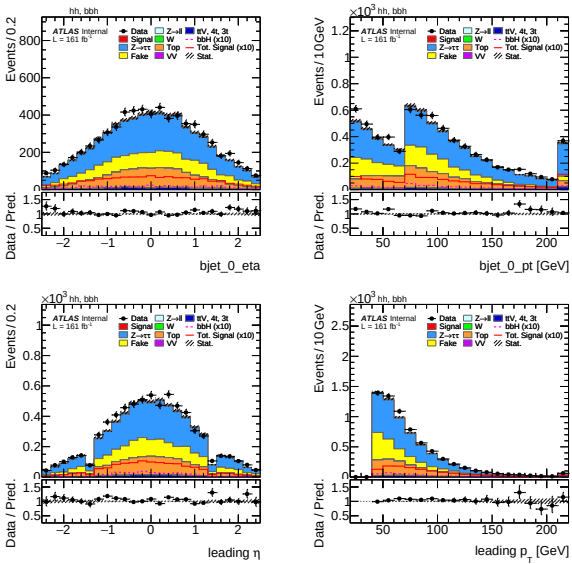
Motivation for bbH Analysis

- **Higgs physics context**
  - Higgs boson discovered in 2012, key to mass generation.
  - Multiple production modes at LHC: ggF, VBF, ttH, bbH.
- **Why bbH?**
  - Direct probe of Yukawa coupling to bottom quarks (y_b).
  - Measuring y_b tests the Higgs mechanism in the Standard Model.
  - Sensitive to potential new physics, as well as setting limits on EFT parametrs
- **Experimental challenge**
  - bbH cross-section is small $\rightarrow$ signal buried in backgrounds.
  - Dominant backgrounds: *ttbar*, multijet, Z+jets.
- **Goal of this analysis**
  - Study bbH production ($H \rightarrow \tau\tau$) using Run 3 ATLAS data and also incorporate Run 2.
  - Validate signal extraction methods and optimize sensitivity.

Results: bbH analysis



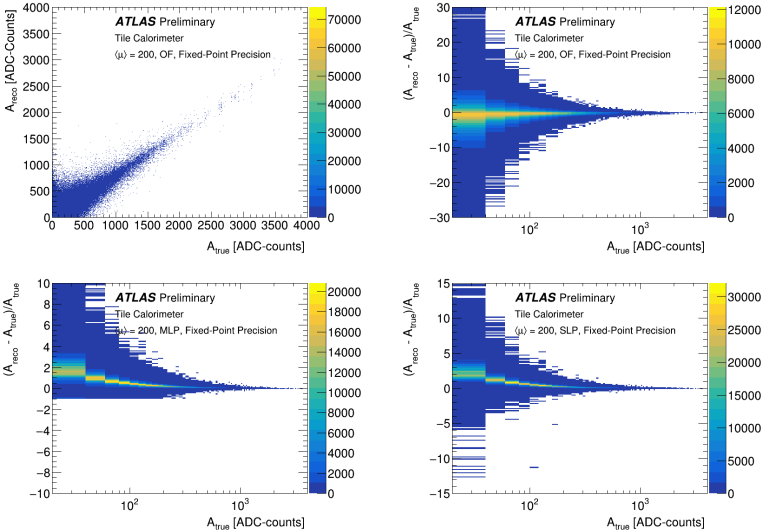
Signal Reconstruction analysis: Objectives

Motivation: The HL-LHC environment demands efficient signal processing to manage high data throughput and pileup.

This project focuses on evaluating reconstruction algorithms, such as Optimal Filtering (OF) and Artificial Neural Networks, suitable for these challenges.
Objective: Select an algorithm that ensures low latency and efficient FPGA resource usage, compatible with the trigger system. A user-friendly framework will be developed to test algorithms using HDL simulators interfaced with python for analysis, estimating latency and resource usage, and comparing online performance with offline methods.

Impact: A robust signal processing algorithm in the pile up environment of the HL -LHC will enhance TileCal performance and trigger efficiency.

Results: Signal Reco study



Activities

- ATLAS Week, Februrary: Poster presentation on FPGA efficiency for Signal Reco algorithms in the ATLAS Tile Calorimter for the HL
- Tile Cal week : Poster presentation on FPGA efficiency for Signal Reco algorithms in the ATLAS Tile Calorimter for the HL - LHC era
- End of Qualification Task - June 2025
- Calo/Forward Shifts : March 2025 - November 2025
- ANIMMA Conference, June: Poster Presentation on FPGA efficiency for Signal Reco algorithms in the ATLAS Tile Calorimter for the HL - LHC era + Conference Proceedings
- ESHEP, Benasque, October: Poster Presentation (Highlight: Discussion sessions and playing snooker)
- CPAN Conference, November: Talk on FPGA efficiency for Signal Reco algorithms in the ATLAS Tile Calorimter for the HL - LHC era