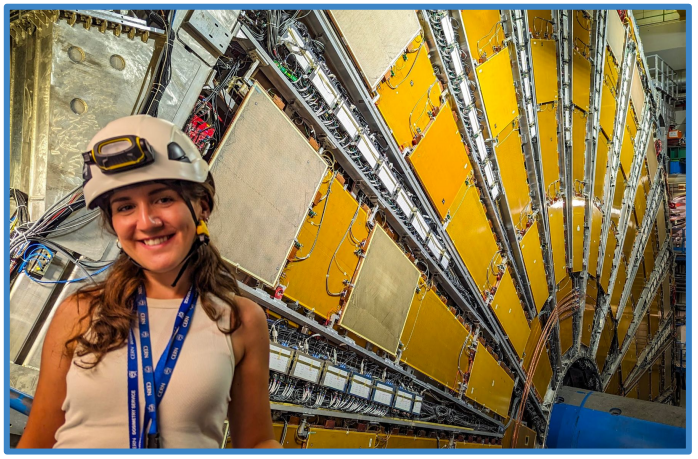
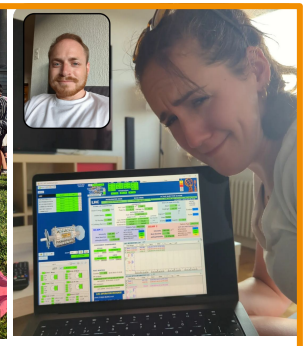
What am I working on?

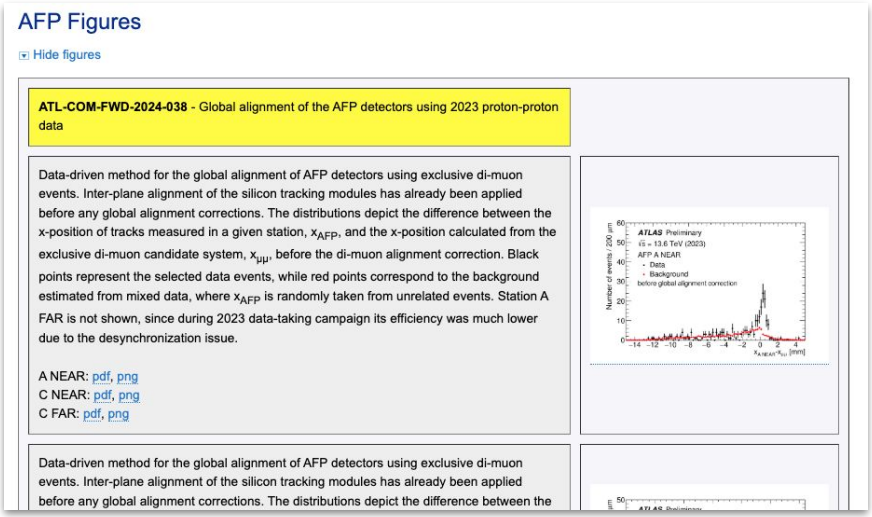
- **Photon-induced WW**
  - → Heavily involved in observation analysis
  - → Unfolded dilepton kinematic distributions in follow-up differential analysis
- **Photon-induced ττ**
  - → Author of pheno study into prospects of constraining tau g-2 in LHC pp collisions
  - → Analysis contact for γγ→ττ in pp analysis
  - → Also involved in ATLAS heavy ion γγ→ττ analysis (mostly through supervision)
- **Forward proton CP**
  - → Convener of AFP CP group (term March 2023–March 2025)
  - → Also involved in ALPs+AFP analysis via CP
  - → ATLAS Roman Pots General Meeting recently
- **NEW! Soft-QCD convener**
  - → Convenership started on 1st Jan 2025





Also lots of operations at CERN as AFP on-call expert

All things AFP CP


AFP Figures

Hide figures

ATL-COM-FWD-2024-038 - Global alignment of the AFP detectors using 2023 proton-proton data

Data-driven method for the global alignment of AFP detectors using exclusive di-muon events. Inter-plane alignment of the silicon tracking modules has already been applied before any global alignment corrections. The distributions depict the difference between the x-position of tracks measured in a given station, x_{AFP}, and the x-position calculated from the exclusive di-muon candidate system, $x_{\mu\mu}$, before the di-muon alignment correction. Black points represent the selected data events, while red points correspond to the background estimated from mixed data, where x_{AFP} is randomly taken from unrelated events. Station A FAR is not shown, since during 2023 data-taking campaign its efficiency was much lower due to the desynchronization issue.

A NEAR: pdf, png
C NEAR: pdf, png
C FAR: pdf, png

Data-driven method for the global alignment of AFP detectors using exclusive di-muon events. Inter-plane alignment of the silicon tracking modules has already been applied before any global alignment corrections. The distributions depict the difference between the

New public plots

- Global alignment of AFP stations in 2023 data using dimuon channel, with dielectron cross-check
- All dimuon results made by Weronika
- Approval in CP meeting on 7th Jan
- All public plots on twiki

AFP content added to PHYS

- From 20th Jan (`nightly/24.0/2025-01-20T2101`), AFP SiT and ToF hits have been merged into PHYS.py [MR!76942]
- Will be included in next round of PHYS derivation production
- Can be used by the majority of CP studies and maybe even future AFP analyses

Adding AFP SiT and ToF hits containers to PHYS

Merged **Savannah Clawson** requested to merge `saclawso/athena:adding_a…` into `main` 4 weeks ago

Overview 19 | Commits 2 | Pipelines 2 | Changes 2

Modifying PHYS.py to include AFP SiT and ToF hits containers, following the instructions here: https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/ModificationsToDAODPHYS.

These containers are planned to be used mostly for AFP CP studies, see recent expression of interest at the ATLAS Roman Pots General Meeting here: https://indico.cern.ch/event/1479988/#237-proton-cp-group-plans.

The AFPSiHitContainer includes

```
depositedCharge,vector<float>,
timeOverThreshold,vector<float>
stationID,vector<int>
pixelLayerID,vector<int>
pixelRowIDChip,vector<int>
pixelColIDChip,vector<int>
```

The AFPToFHitContainer includes

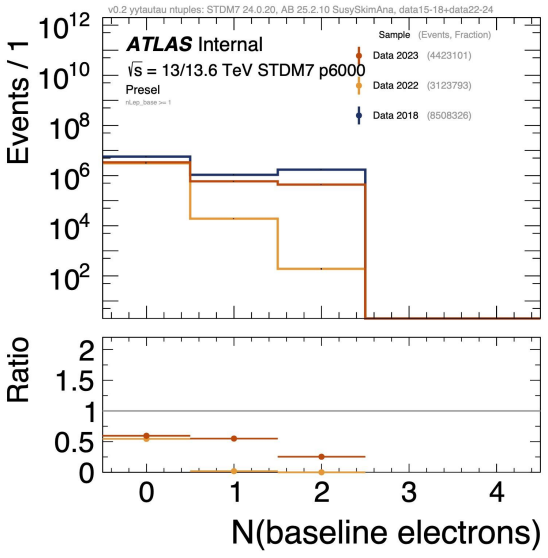
```
time,vector<float>
hptdcChannel,vector<int>
barInTrainID,vector<int>
trainID,vector<int>
pulseLength,vector<float>
hptdcID,vector<int>
```

The file size increase for data is roughly 1.5%. There is no change for MC as AFP hits are not available in MC.

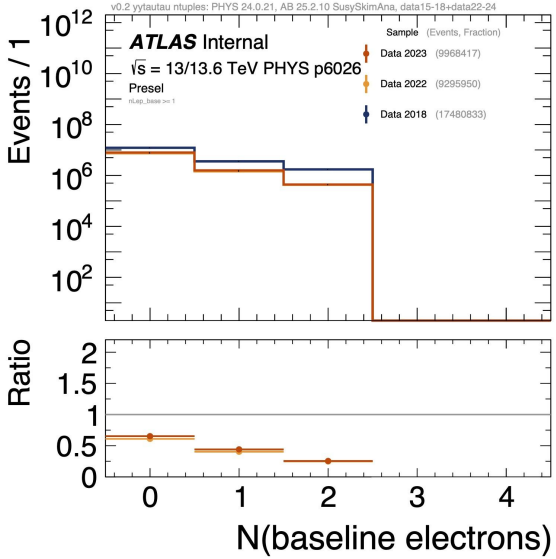
Testing official STDM7 derivations

- **REMINDER:** Electron deficit seen in 2022 STDM7 data
  - ➞ See my talk here
- New STDM7 data looks similar for 2022 and 2023, i.e. **we no longer see an electron deficit**
- **WARNING:** Plots are not an apples-to-apples comparison (different baseline cuts)

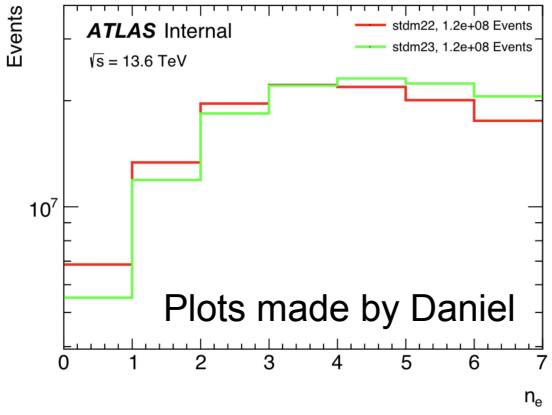
STDM7 24.0.20 (p6000)



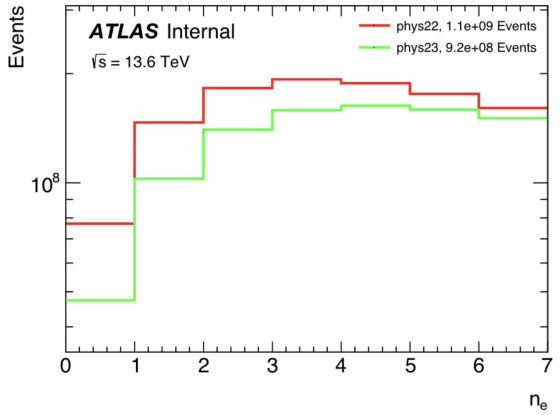
PHYS 24.0.21 (p6026)



STDM7 25.0.19 (p6483)

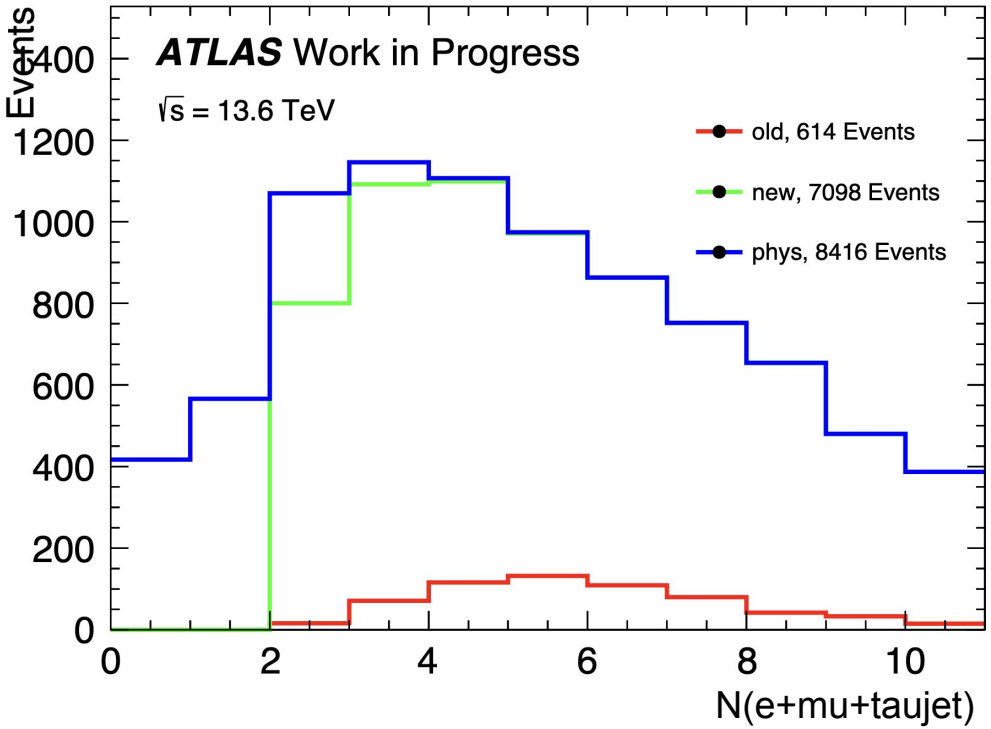


PHYS 25.0.19 (p6482)



Updating custom SM derivations

- I have been updating custom derivations (STDM7) for photon-fusion analyses to consider TauJet objects as leptons (for skimming requirements)
- STDM7 requires at least two leptons in the events (passing basic preselections)



Old skim: N(e+mu) >= 2

New skim: N(e+mu+tau) >=2

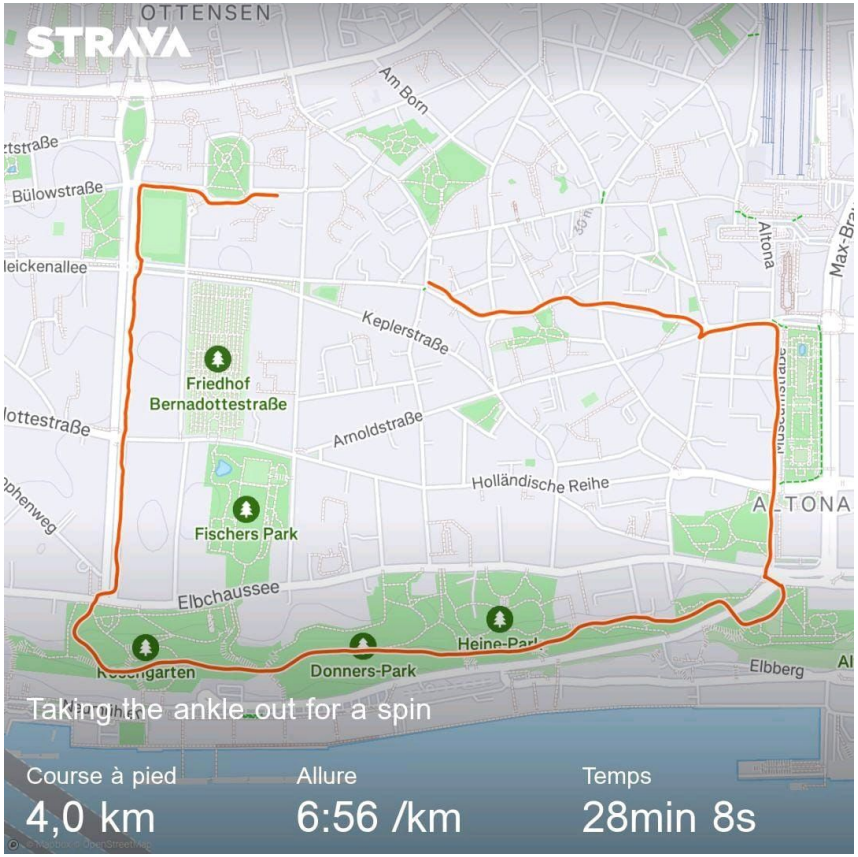
PHYS: No skim on N(leptons)

Plot made by Daniel

- Looks like lepton skim is working as expected
- Large difference in event yield probably due to lack of trigger skim in new STDM7

(Slowly) recovering from injury

- Managed my first jog/run yesterday after injuring my ankle in November



- Hoping to run Hamburg marathon at the end of April 😬

Backup

Comparison of derivations

PHYS

- Thinning of excess containers which also skims based on physics object properties
- **Trigger skim:** none
- **Electron skim:** none
- **Muon skim:** none
- **Tau skim:** $p_T > 13$ GeV
- **Track skim:** TightPrimary, z0*sin(θ) < 3 mm, $p_T > 10$ GeV
- **Lepton selection:** none

Generally, "none" here refers to whatever is done in the common derivation framework

Old STDM7

- No particular container thinning
- AFP containers added
- **Trigger skim:** lowest unprescaled electron and muon triggers, and combinations of the two
- **Electron skim:** $p_T \geq 11$ GeV, $|\eta| < 2.6$, LooseID
- **Muon skim:** $p_T \geq 4$ GeV $|\eta| < 2.6$, pass DerivationFramework presel and ID cuts
- **Tau skim:** none
- **Track skim:** none
- **Lepton selection:** ≥ 2 leptons passing skim conditions (e and mu)

New STDM7

- Same container thinning as PHYS
- AFP containers added
- **Trigger skim:** none
- **Electron skim:** same as old STDM7
- **Muon skim:** same as old STDM7
- **Tau skim:** $p_T > 13$ GeV (now added $|\eta| < 2.6$ and LooseID)
- **Track skim:** none
- **Lepton selection:** same as old STDM7

New STDM7 + tau skim

- Identical to new STDM7 but with updated skimming selection to include hadronic taus in two lepton selection

QUESTIONS:

Do we still want to skim on lepton triggers? (with added tau triggers)

Any other selections to add to skim?

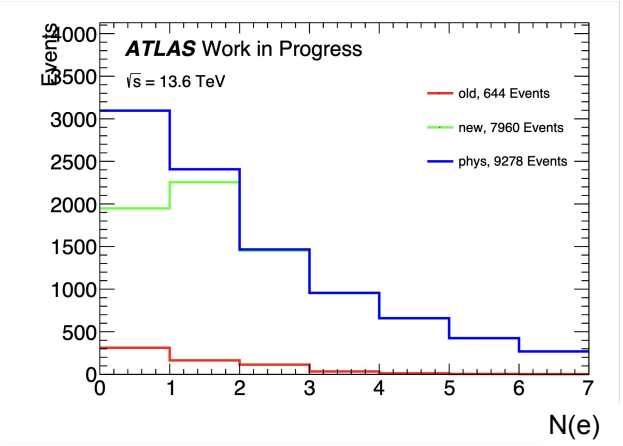
Currently no nch filter implementation - biases track veto efficiency studies so maybe leave for the time being but will want eventually to increase MC stats

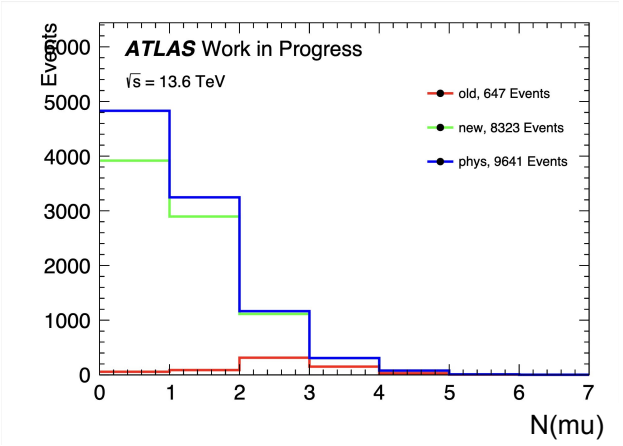
Updates in my personal fork of Athena

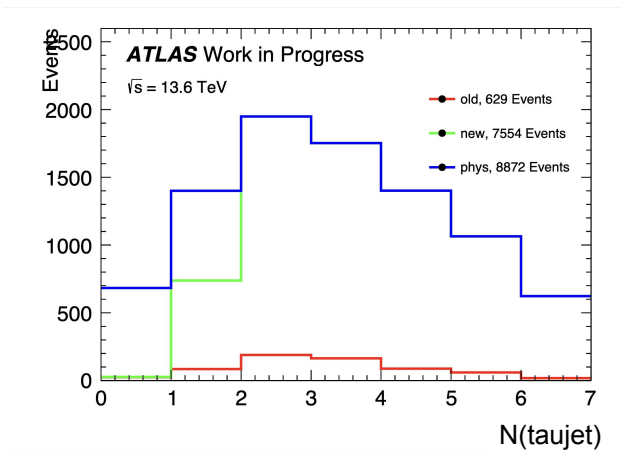
All derivations produced using Athena 25.0.19 (with local modifications for new STDM7)

Preliminary validation tests

- Comparing PHYS, old STDM7, new STDM7 with skim on taus
  - ➞ All using Athena 25.0.19, TopCPToolkit v2.15.0 and FastFrames v4.0.0
- 10k events of Run 438481 from 2022 (random run that was in the AllGood GRL for 2022)
- Very basic event selection applied, GRL, lepton pT > 4, 11, 13 GeV for e, mu, tau, abs(eta) < 2.6







- Majority of events have at least one tau when applying lepton skim - is this expected?
- Difference in N(e) and N(mu) shape due to additional trigger skimming in old STDM7..?
  - ➞ Trigger skim has higher pT thresholds (18 GeV for electrons and 15 GeV for muons) than simple lepton skim (11 GeV and 4 GeV)
  - ➞ Should test impact of adding lepton skim to new STDM7

Preliminary validation tests

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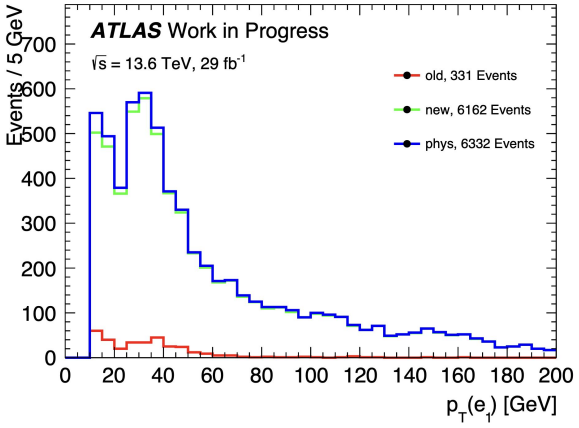

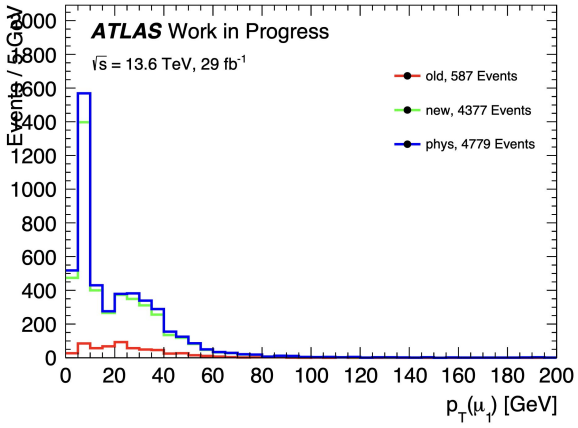

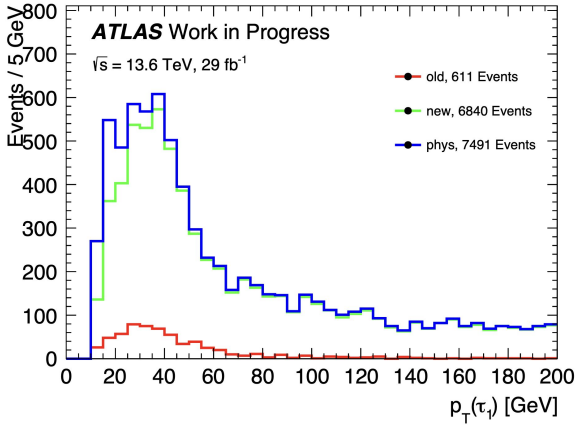

- Different thresholds due to skimming requirements
- Double peak structure due to difference in lepton reco and trigger thresholds