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# 2016 Reach Estimate using 10% Data (Blinded)

## Zcut Update

Analysis Meeting 09/05/2023

Alic Spellman

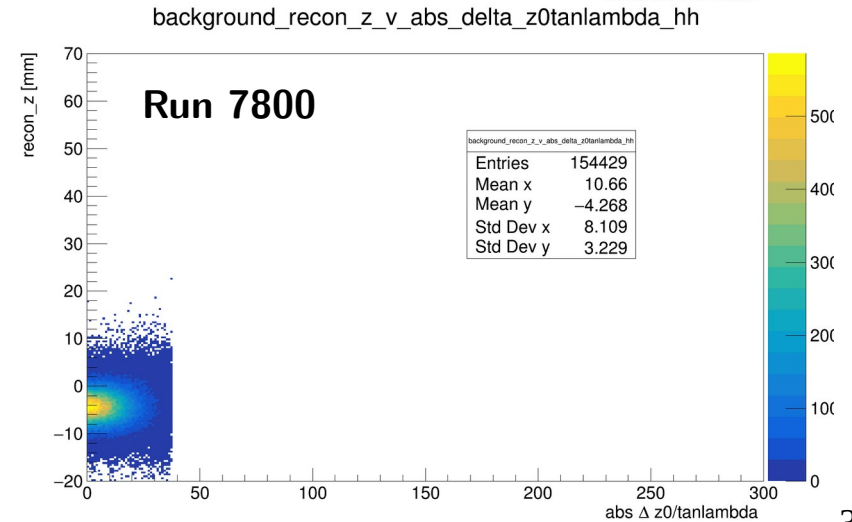
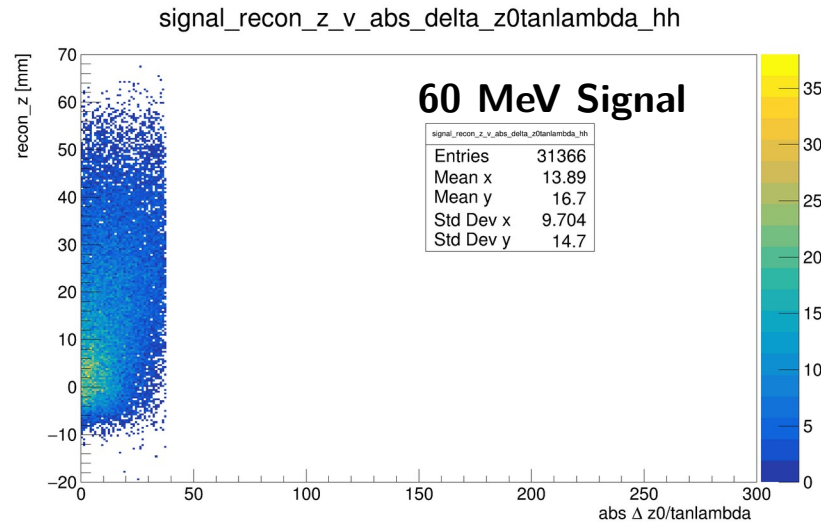
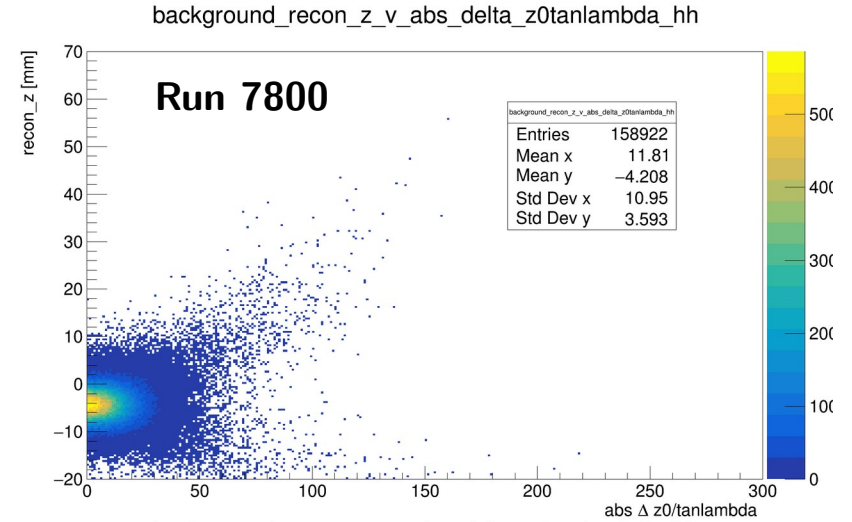
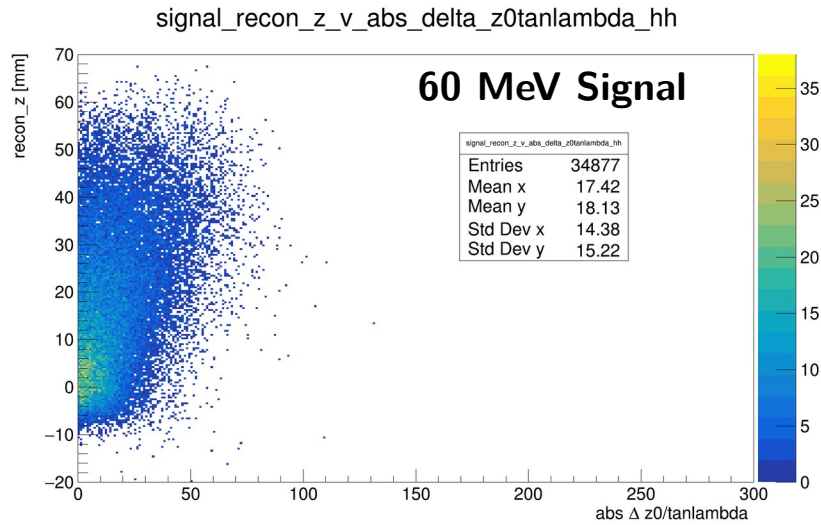


# Introduction

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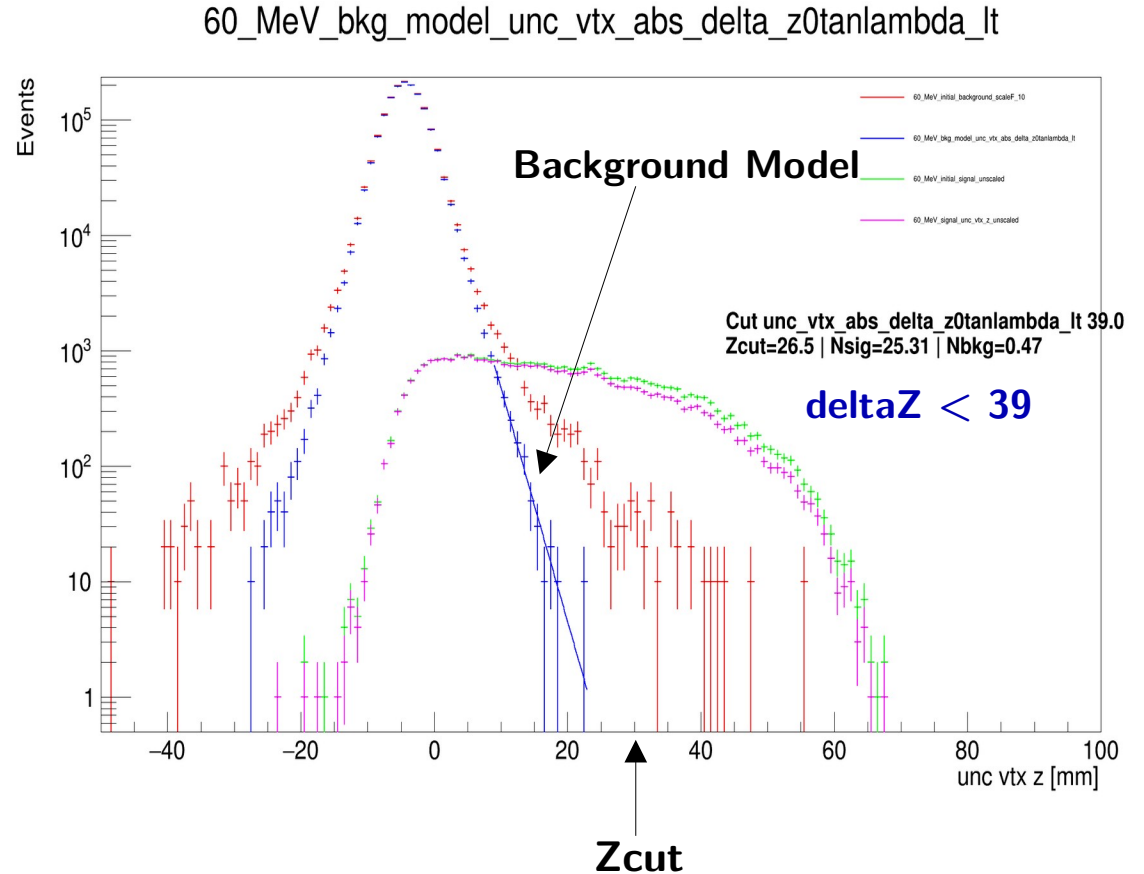
- Previously showed 2016 SIMP Reach estimate for 10% Data (BLPass4)
- Zcut used was chosen qualitatively rather than quantitatively
- **Updated reach estimate using better-derived Zcut**
  - **Zcut where  $< 0.5$  Nbkg expected**
- Applied **single high-z background cut,  $\text{abs}(\Delta z_0/\tan\lambda)$**  for all masses
  - Referred to as **'deltaZ'** cut (for now)
- Updated results are comparable, expect max of  $\sim 19$  events in 10% data
  - For  $\alpha_D = 0.01$  and  $m_\pi/f_\pi = 4\pi$

# 'deltaZ' Cut Variable



# deltaZ and Zcut Positions

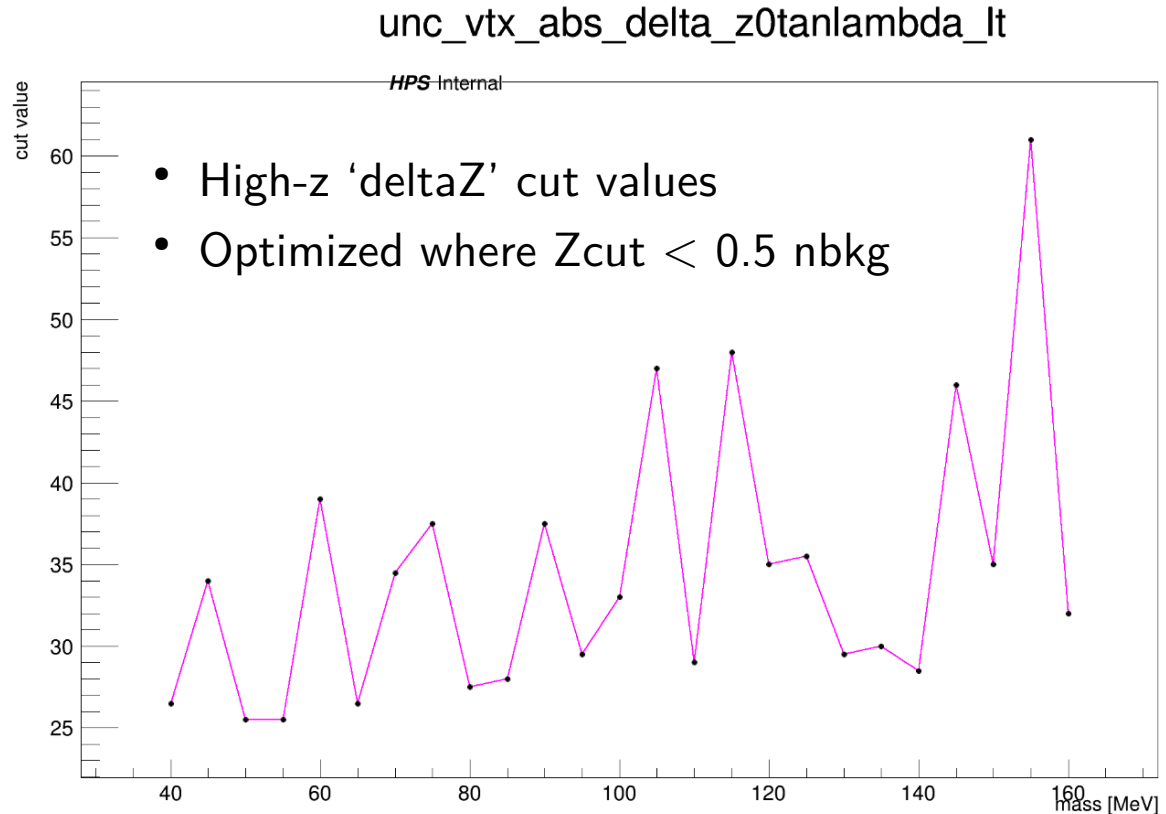
- Need to find values of deltaZ, and then Zcut, to use for new reach estimate
- **deltaZ(m<sub>VD</sub>) cut optimized** using ZBi at Zcut < 0.5 nbkg
- **Run 7800** data in Signal Region scaled up by **10** (~1% to ~10%)
- **Background model** → scaled data **fit** with exponential tail
- **Zcut(m<sub>VD</sub>)** where < **0.5 bkg** events



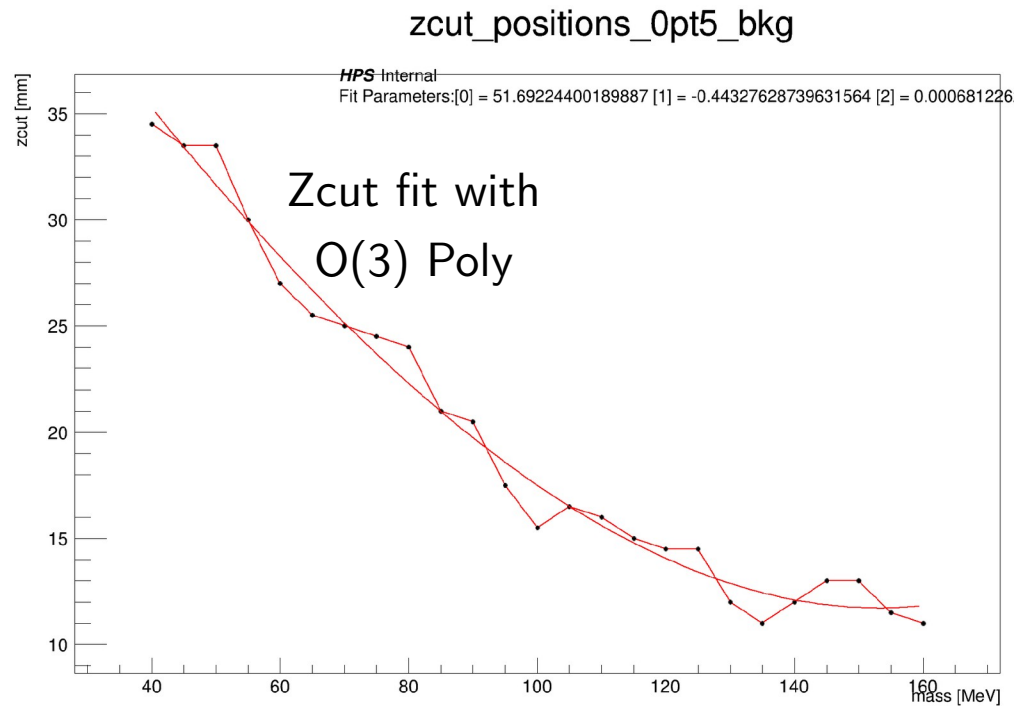
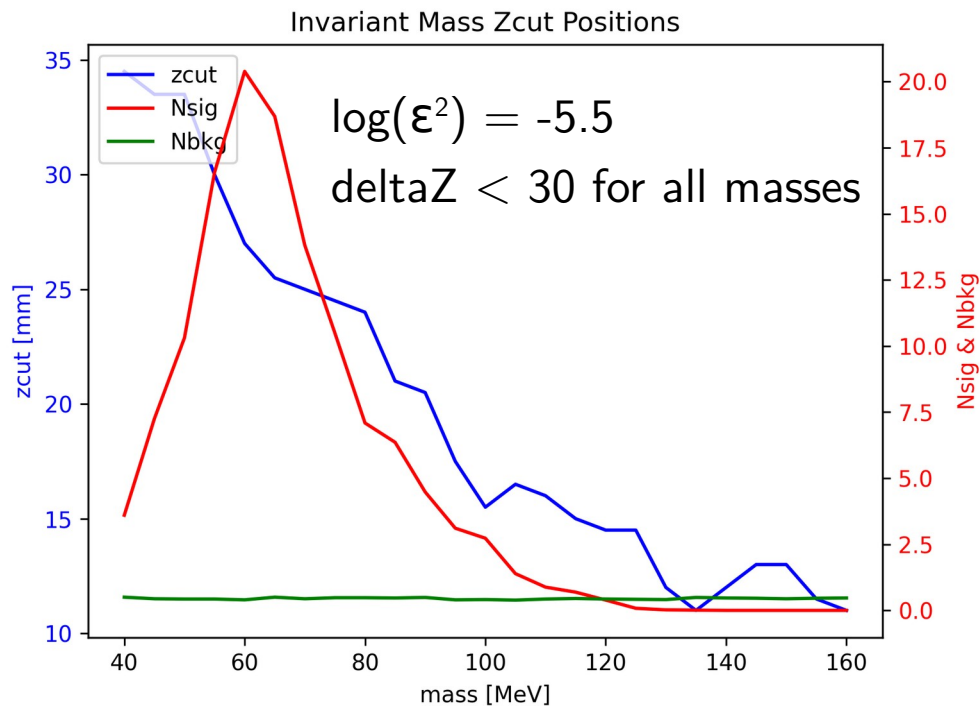


# deltaZ Optimization as Function of Mass

- Slight trend in deltaZ(mass)
- **Choose single deltaZ cut for all masses**
  - **deltaZ < 30**
- **Re-run all masses to find corresponding Zcut**
- Run new Reach Estimate

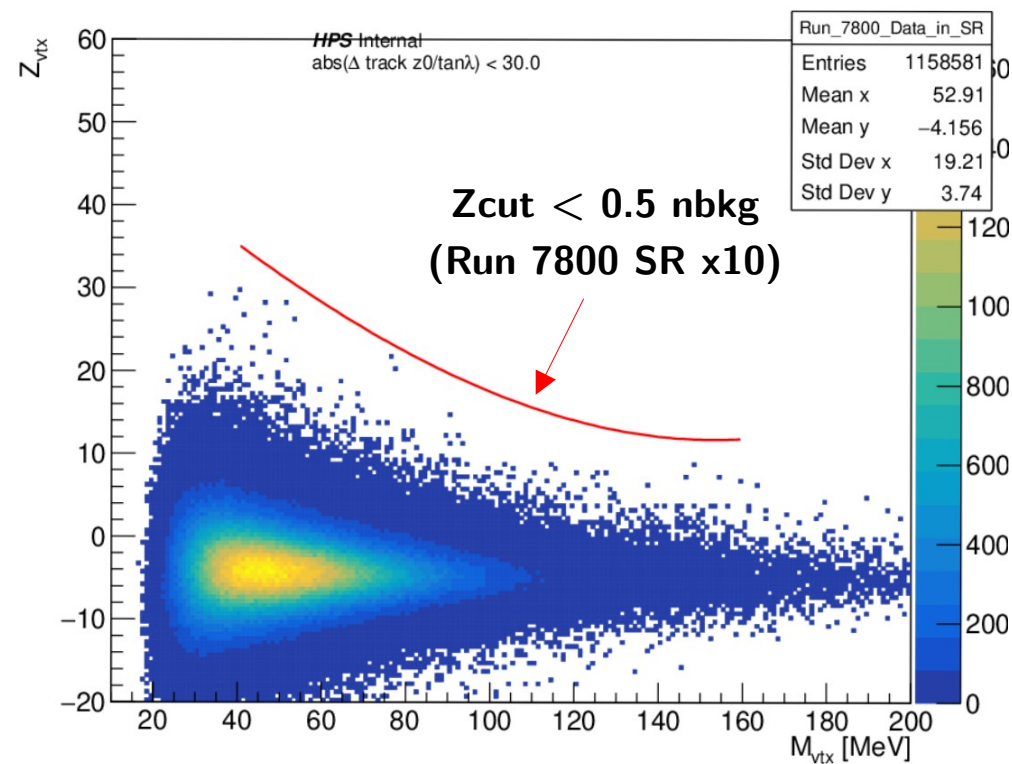


# Zcut after applying $\Delta Z < 30$

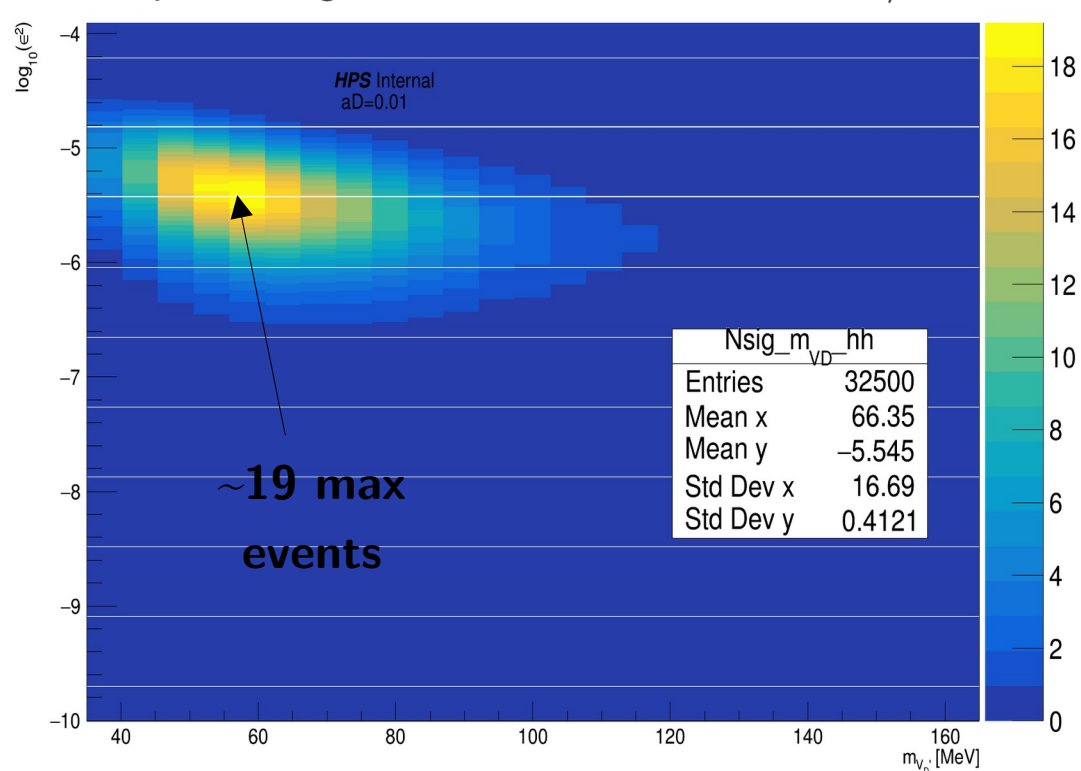


# New 2016 Reach Estimate Results for 10% Data

## Unscaled Run 7800 Data in SR



## Expected Signal 10% Data – $\alpha_D = 0.01$ , $m_\pi/f_\pi = 4\pi$



# Discussion

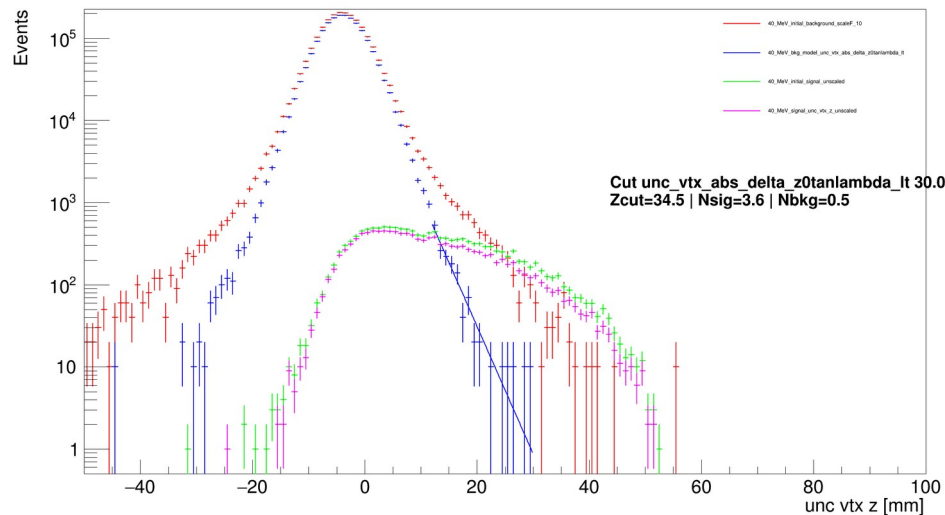
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- 'deltaZ' cut ( $\Delta$  track  $z_0/\tan\lambda$ ) reduces high-z tails while keeping signal efficiency high
- Applied deltaZ  $< 30$  for all masses, calculated Zcut position  $< 0.5$  nbkg
- Reach estimate using this combination shows max expected events  $\sim 19$
- Sensitive to signal  $\leq 100$  MeV VD in 10% data
- Plenty of room to tighten deltaZ cut, and further high-z cuts yet to be implemented
  - Impact Parameter and V0 projection specifically
  - Expect background further reduced
- Background sample used here fairly small, low stats in high-z tails...
- Intend to use 10% data mass side-bands to optimize high-z cuts
- Next:
  - look at Impact Parameter cut on top of deltaZ
  - Set up V0 projection cut

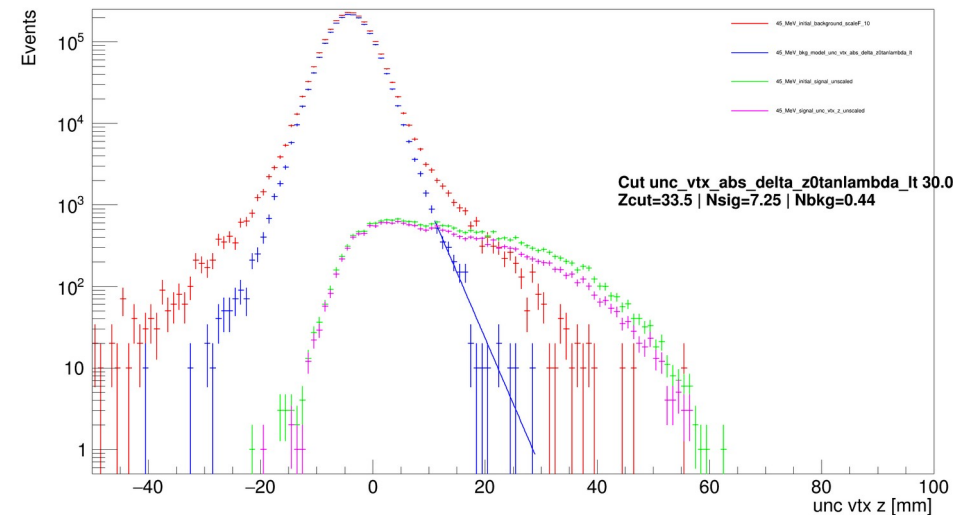
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# Backup

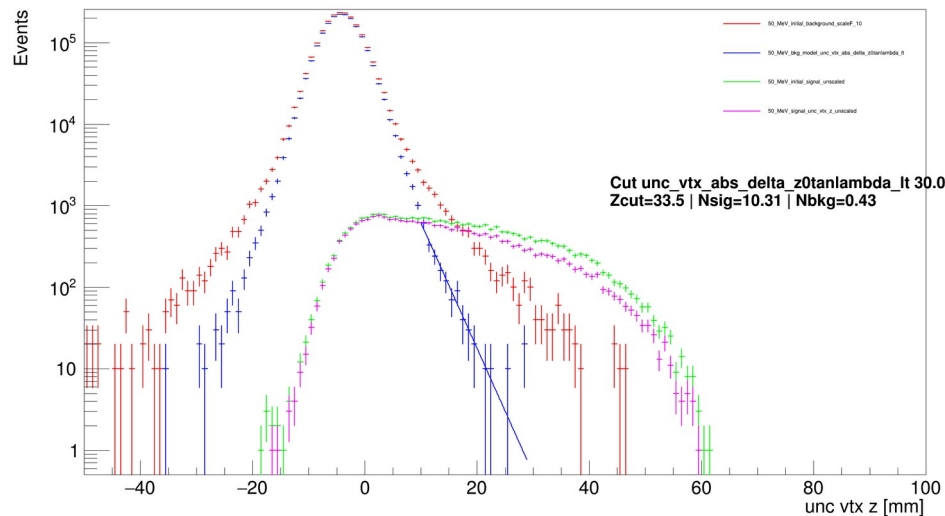
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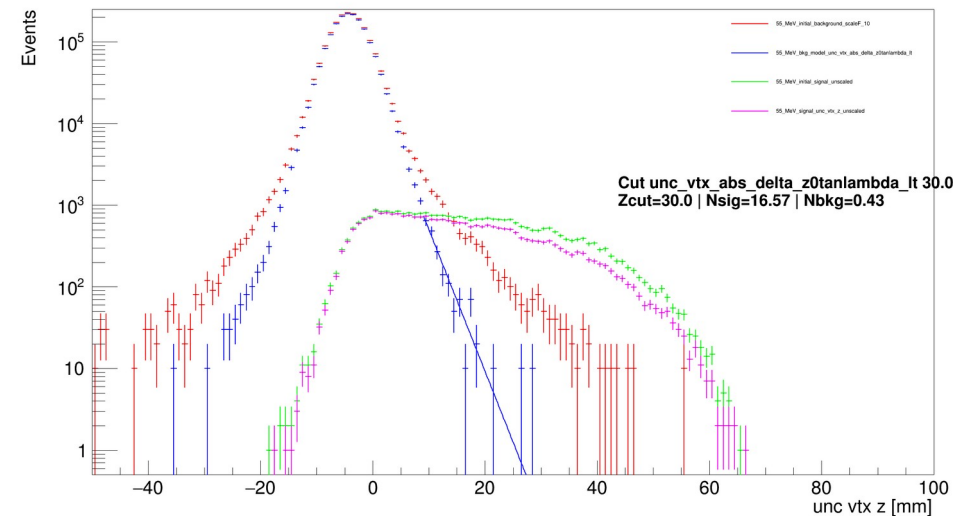
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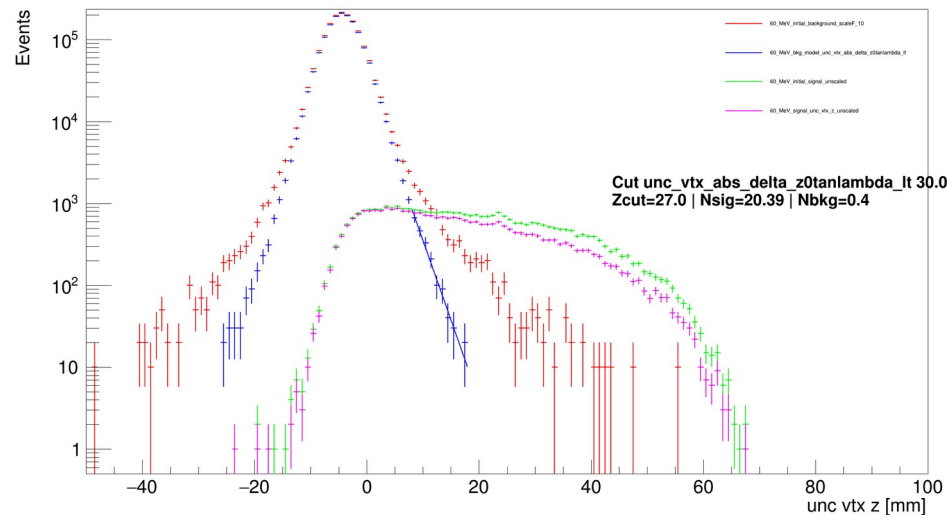
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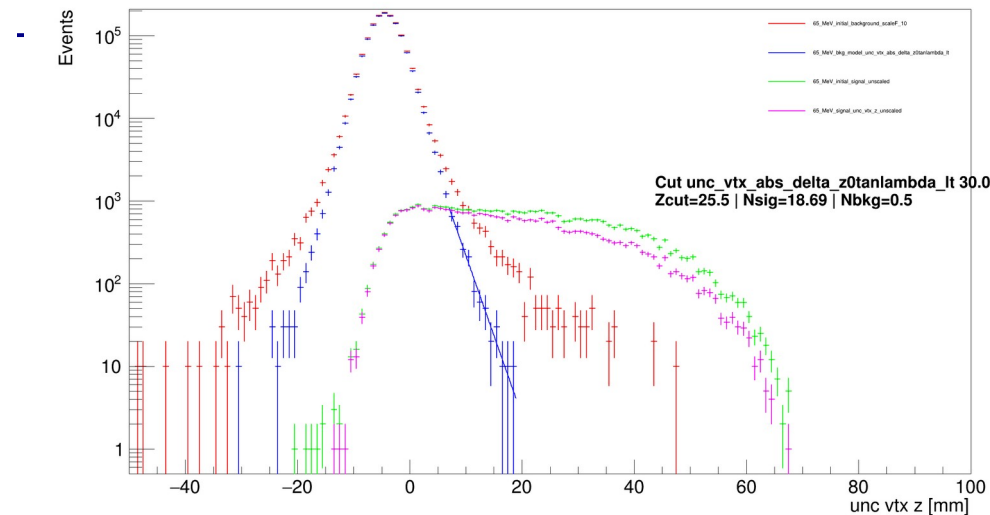
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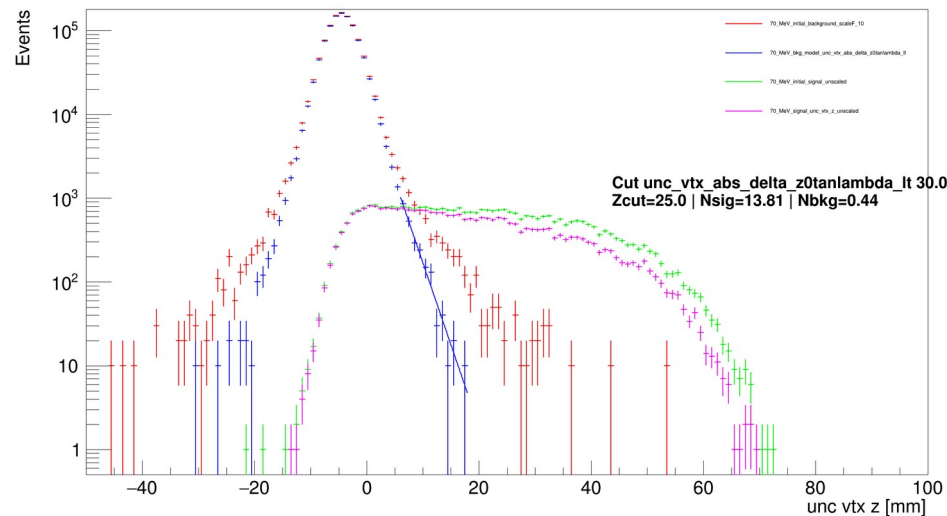
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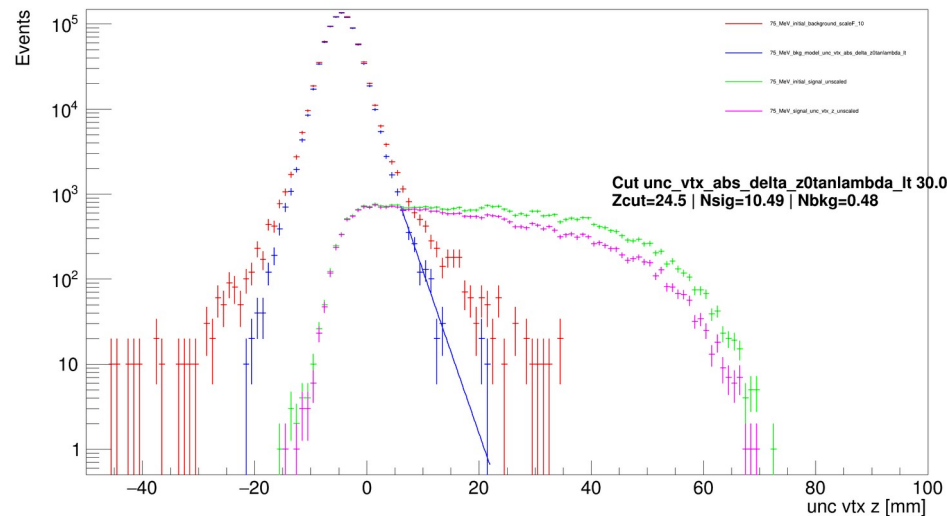
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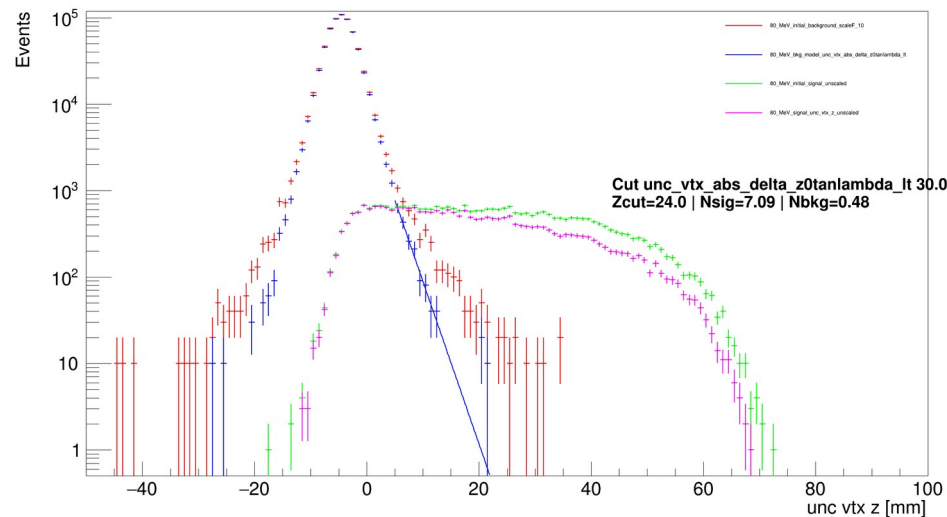
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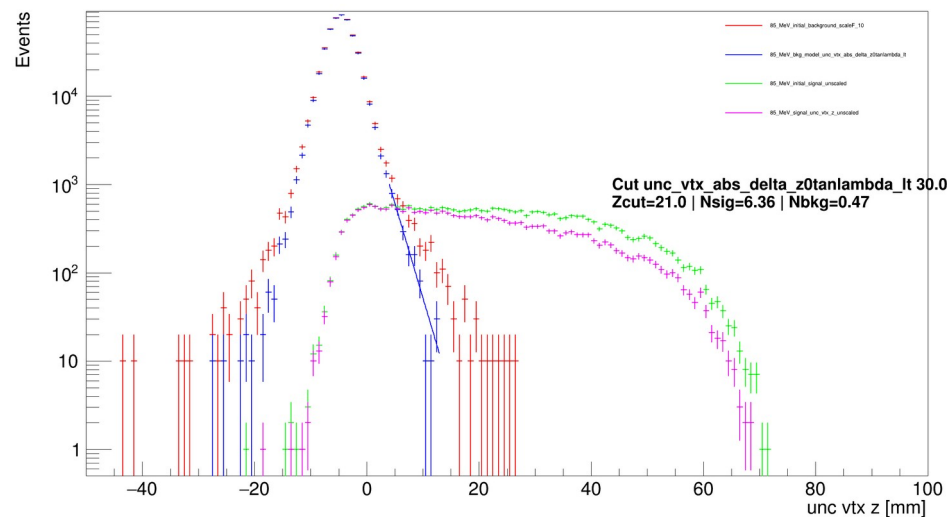
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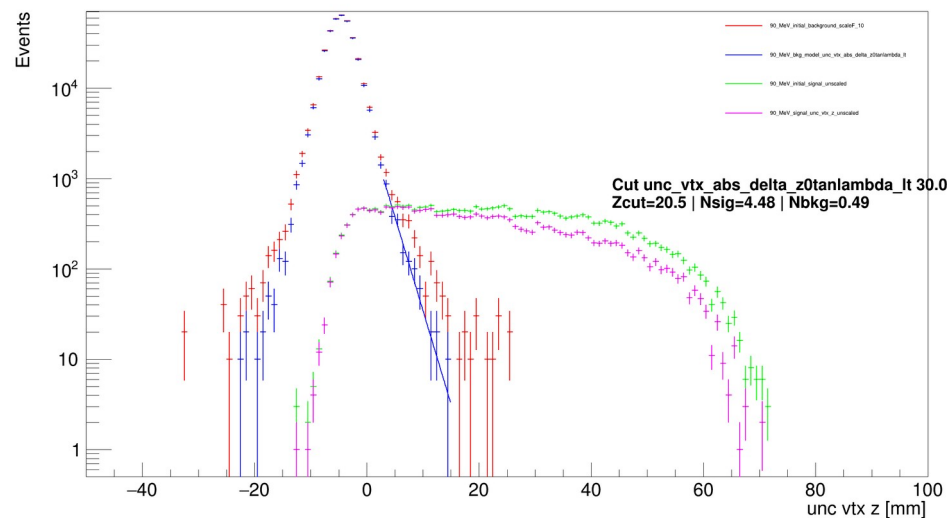
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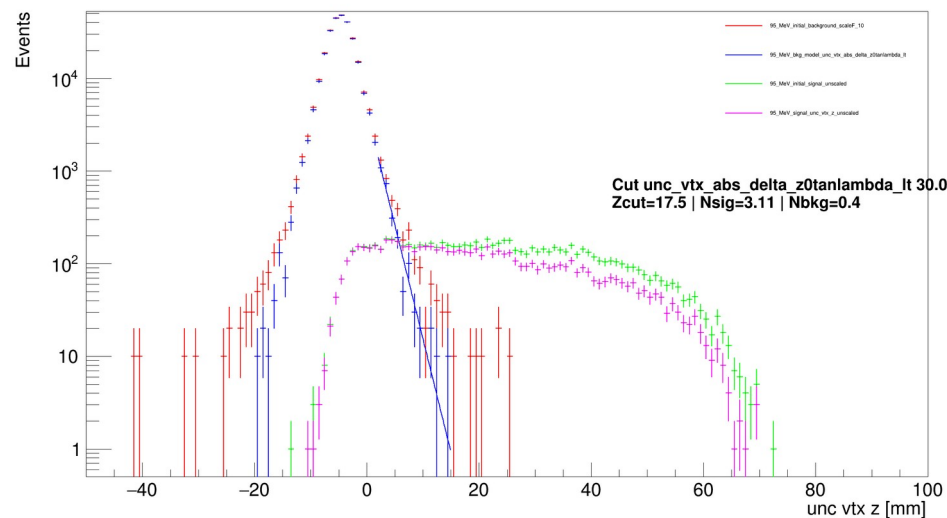
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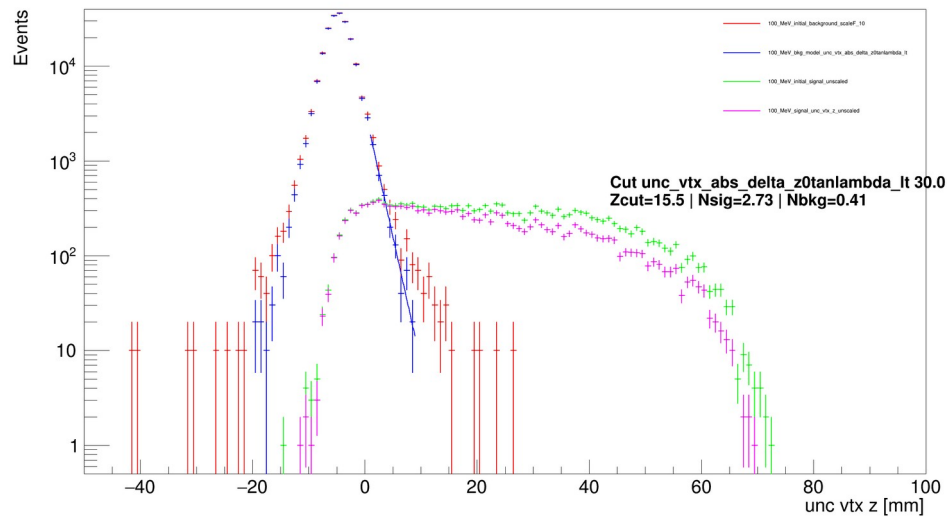


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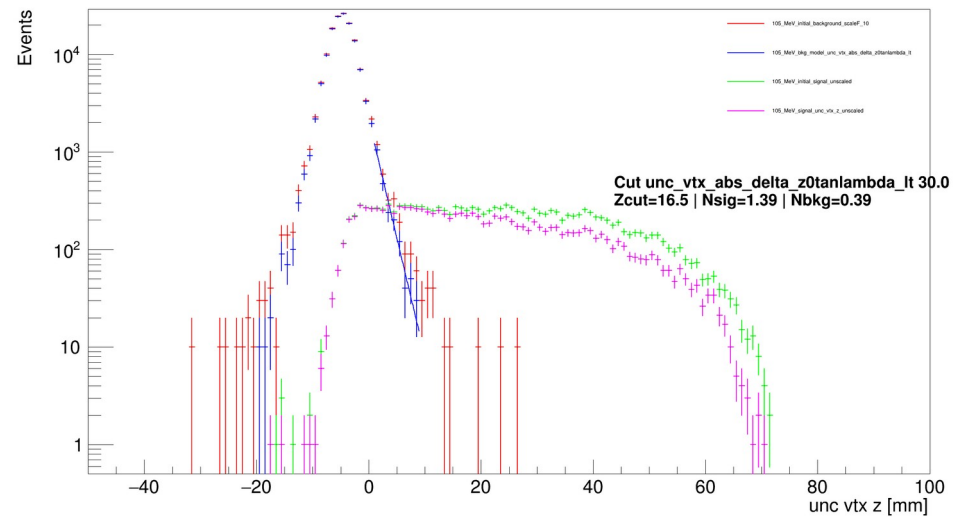




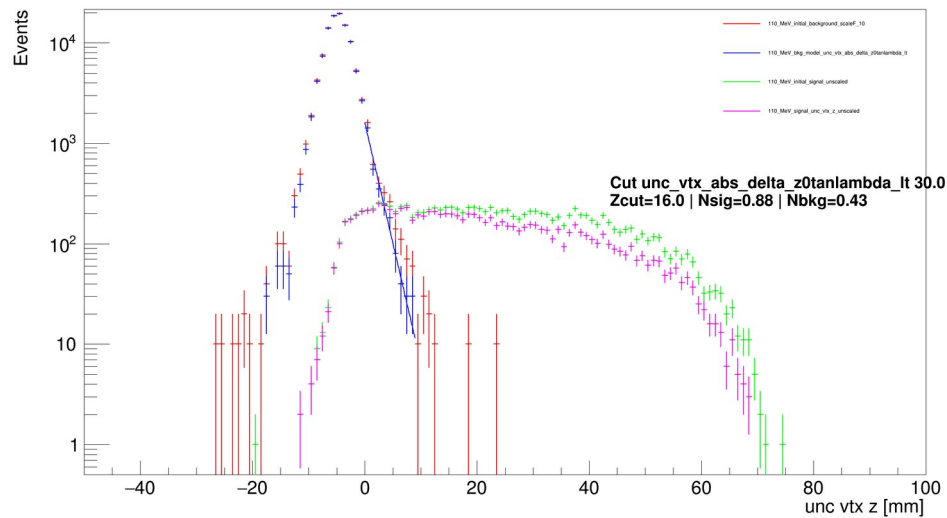
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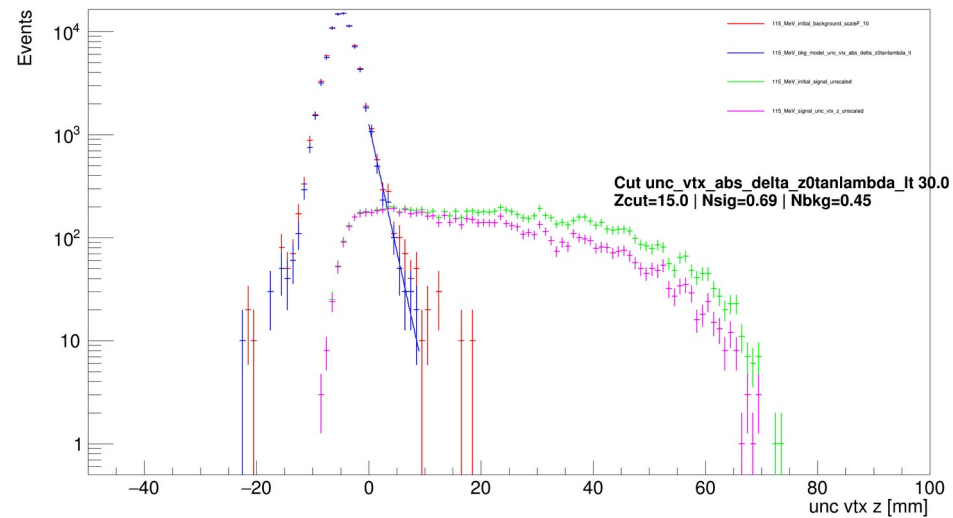
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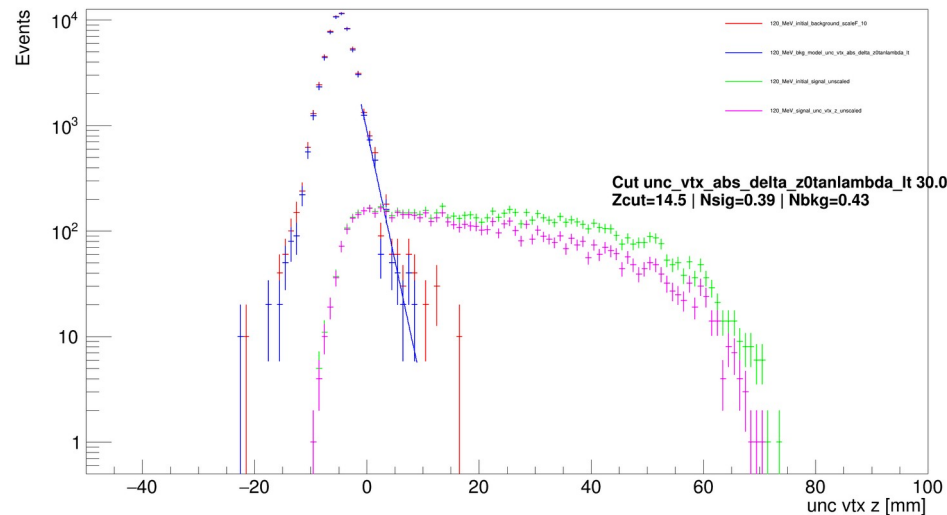
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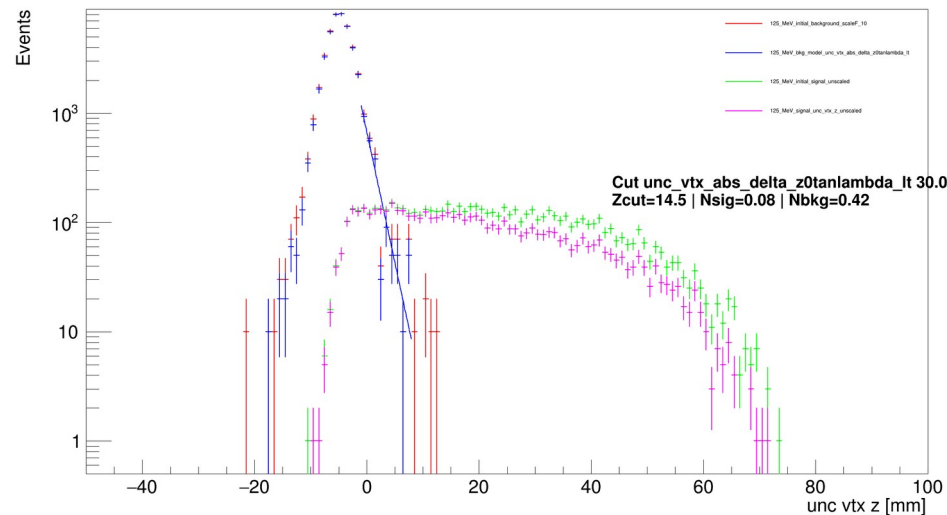
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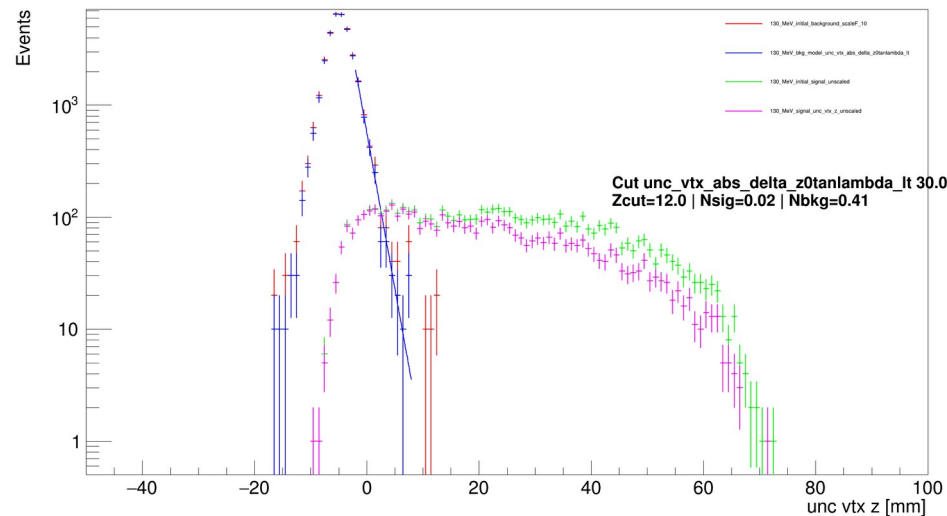
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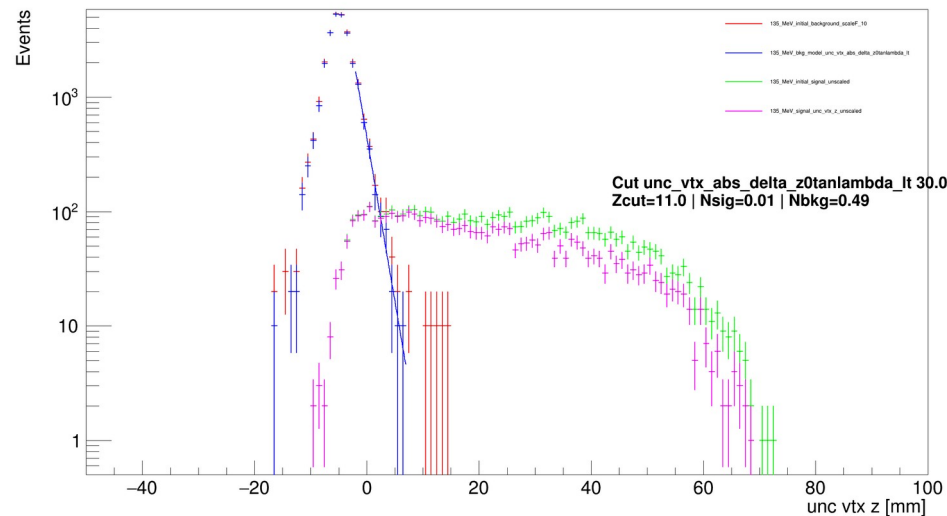
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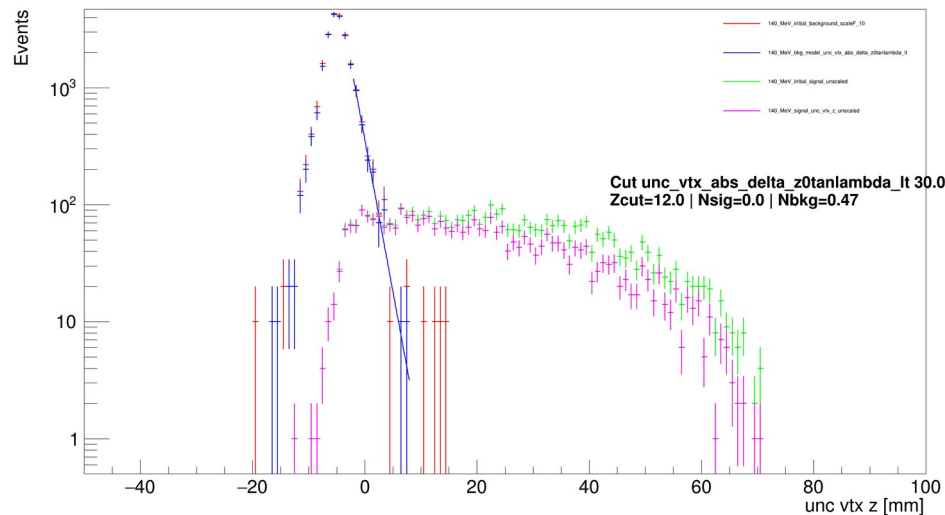
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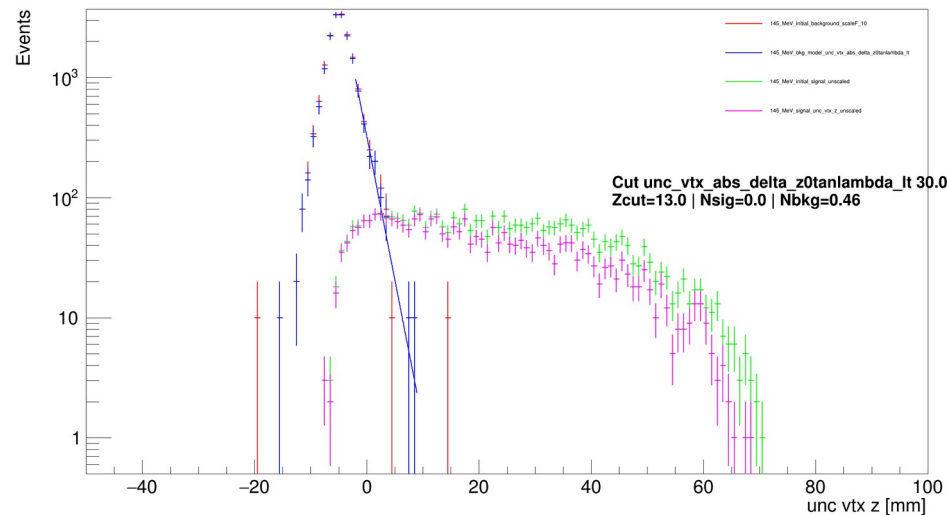
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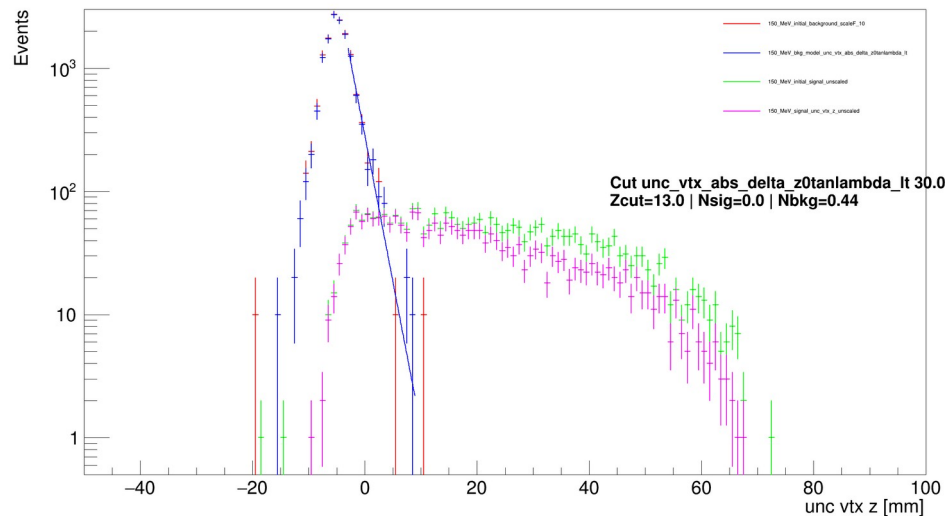
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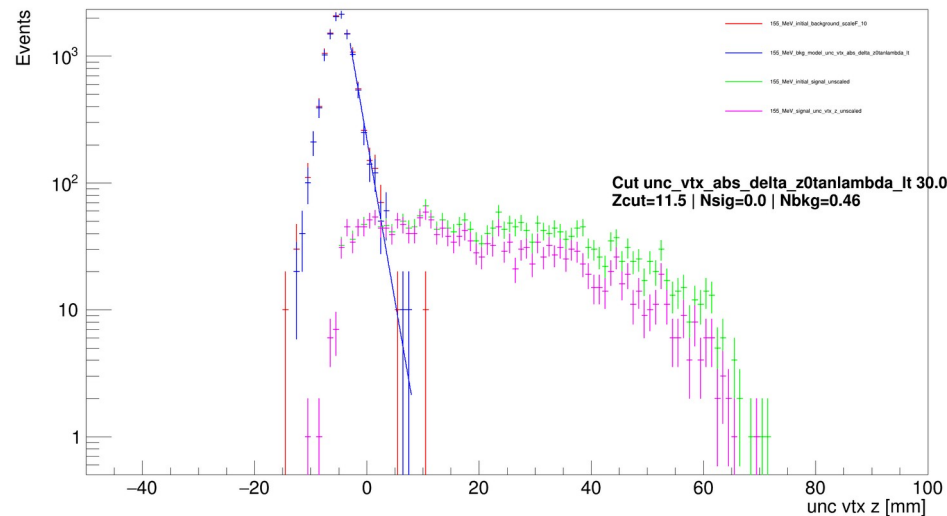
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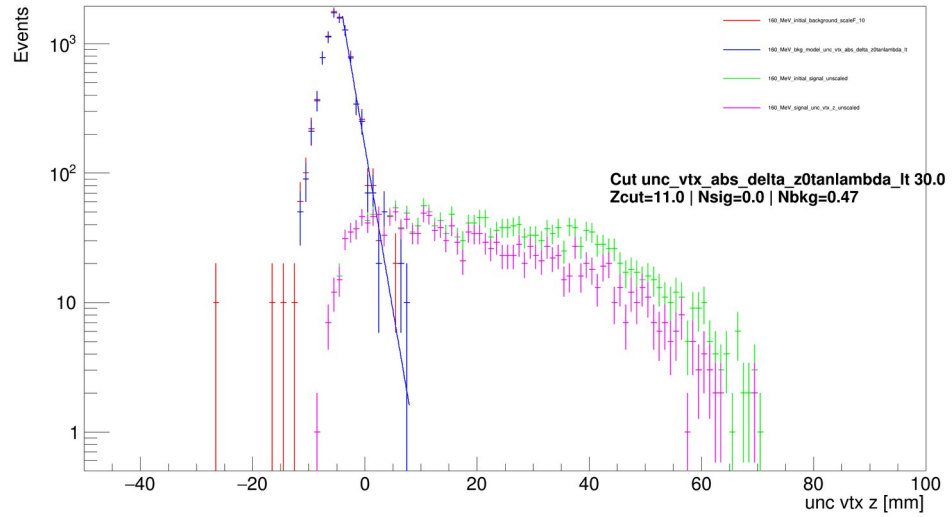
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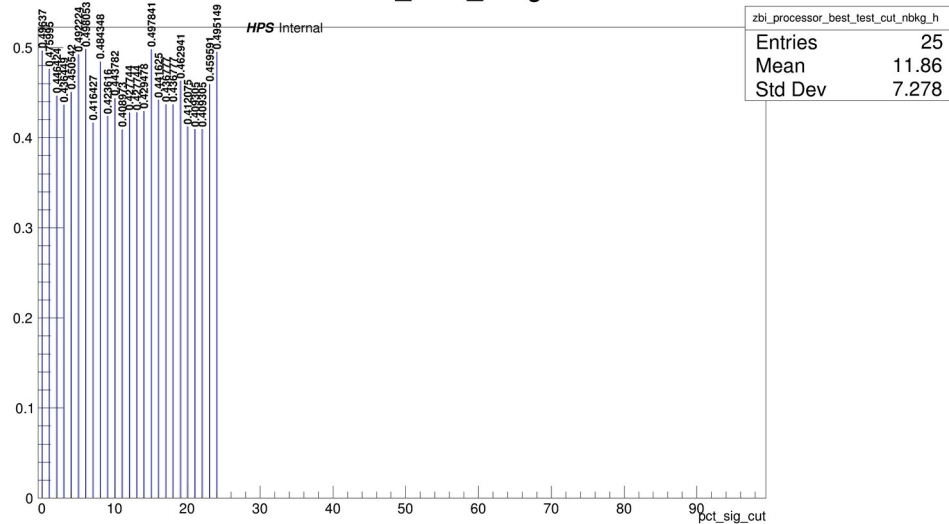
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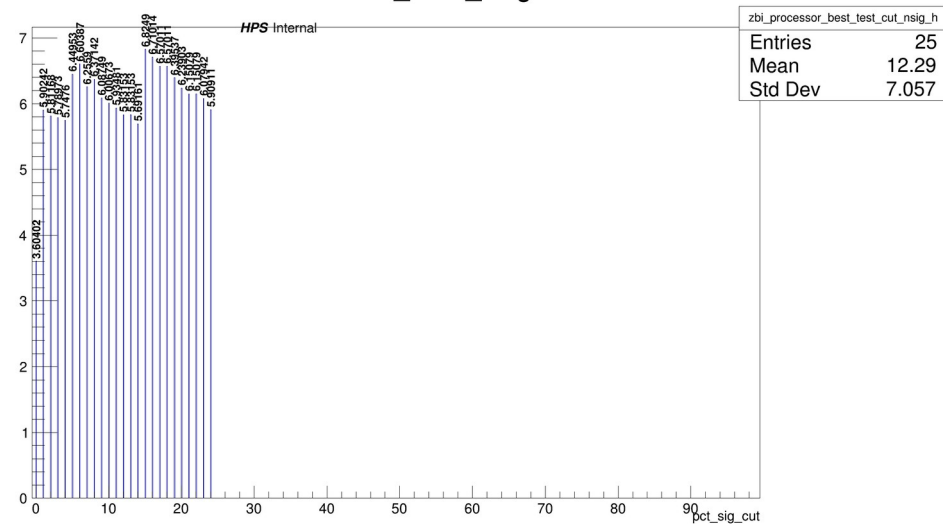
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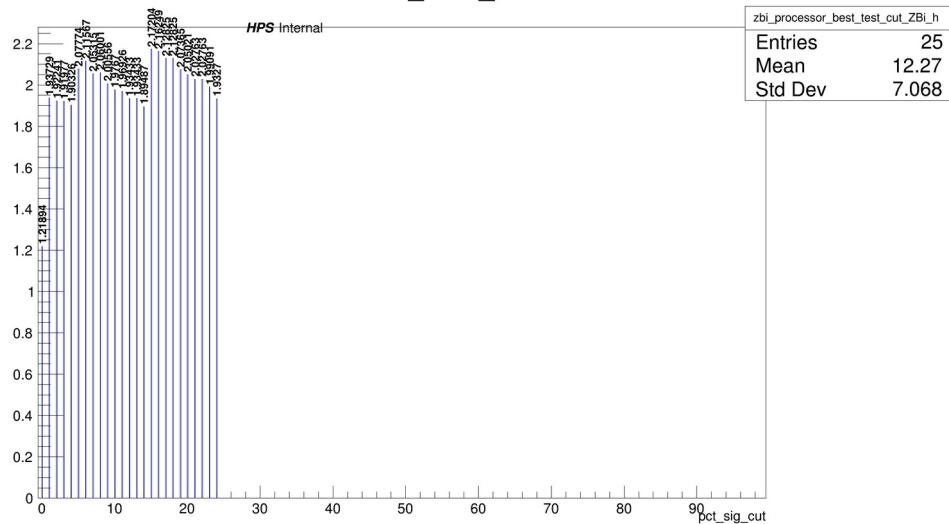
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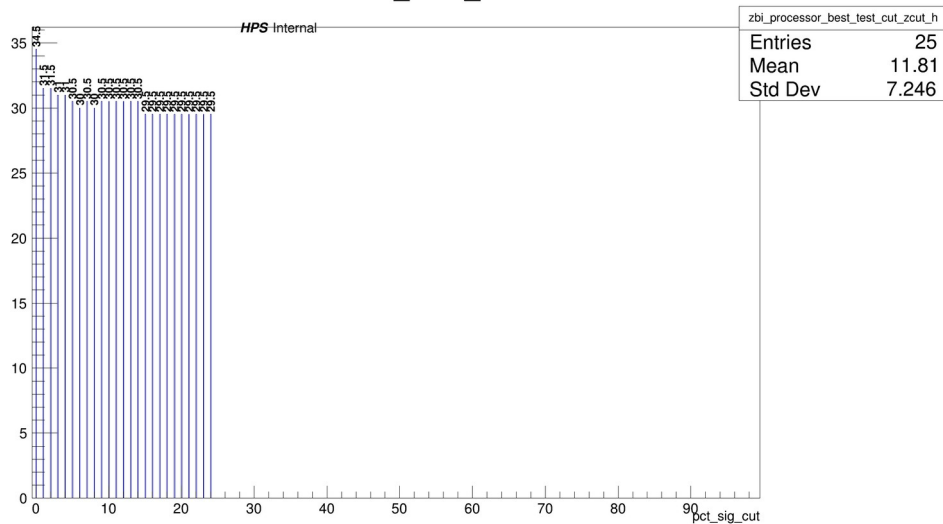
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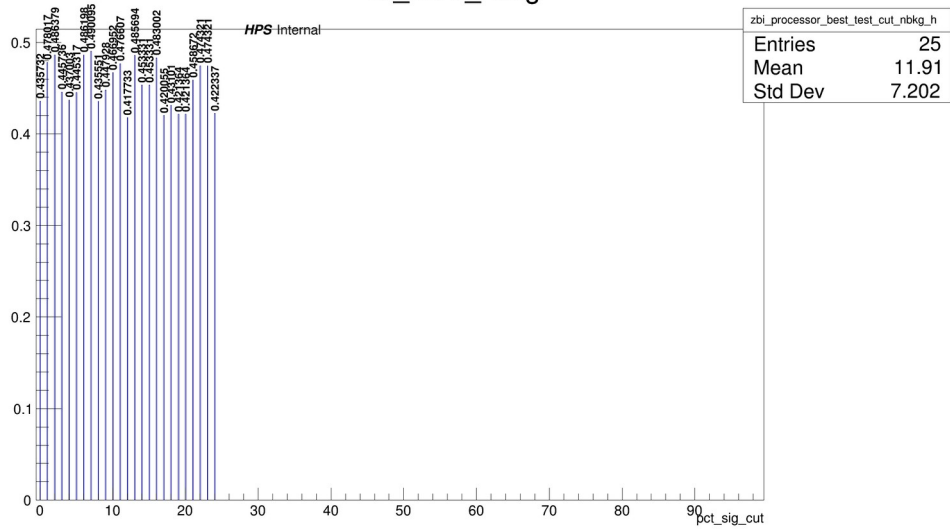
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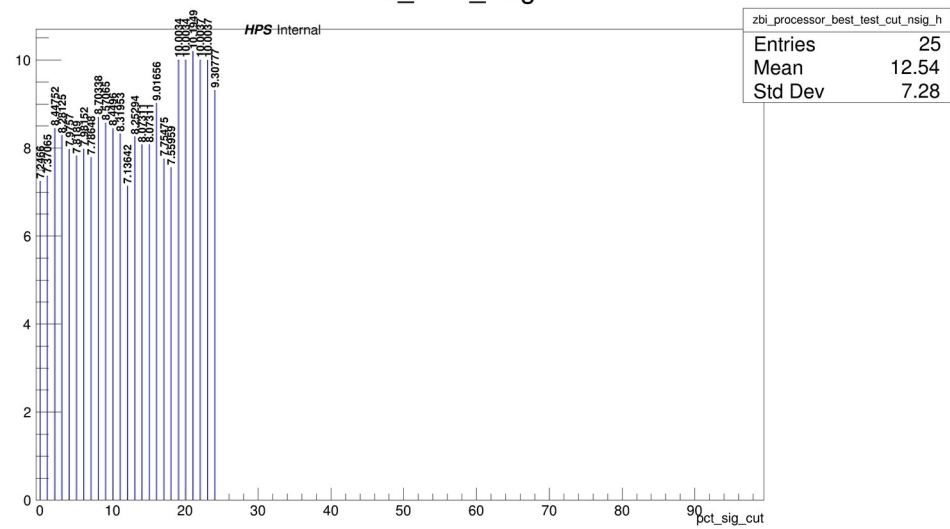
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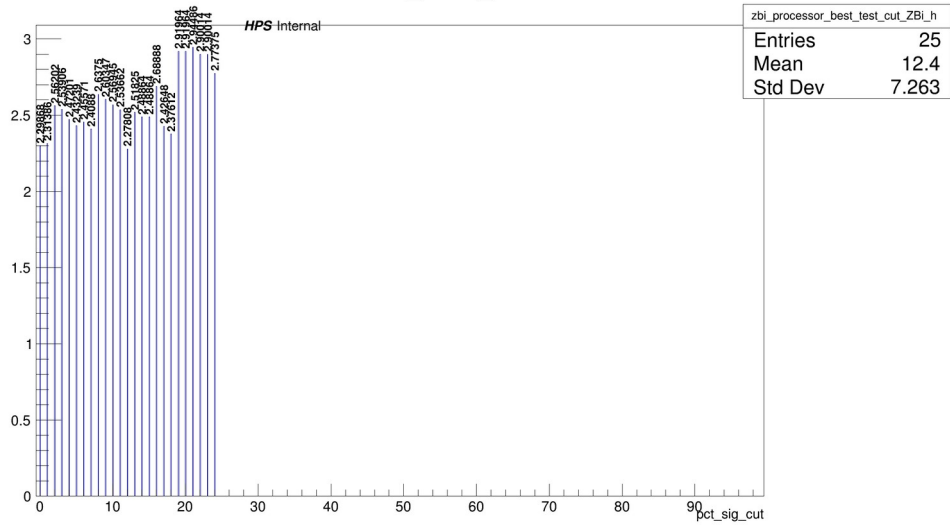
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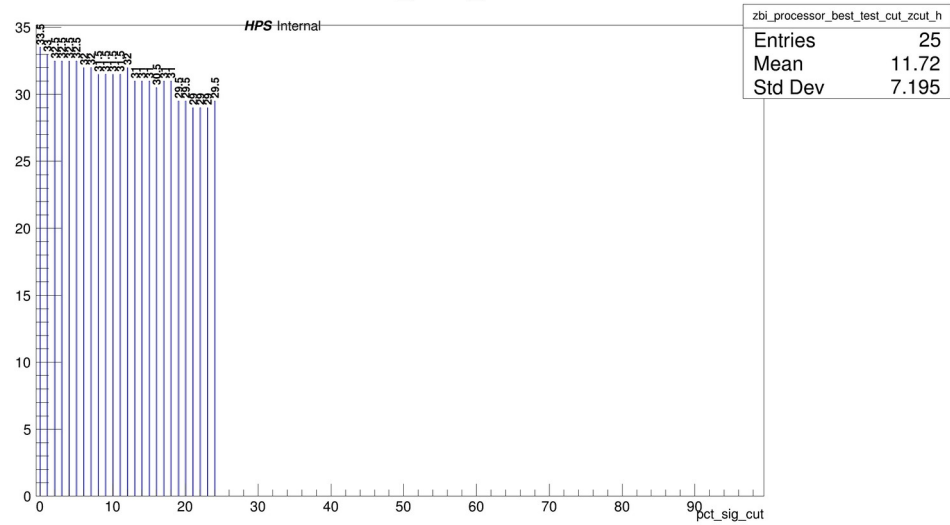
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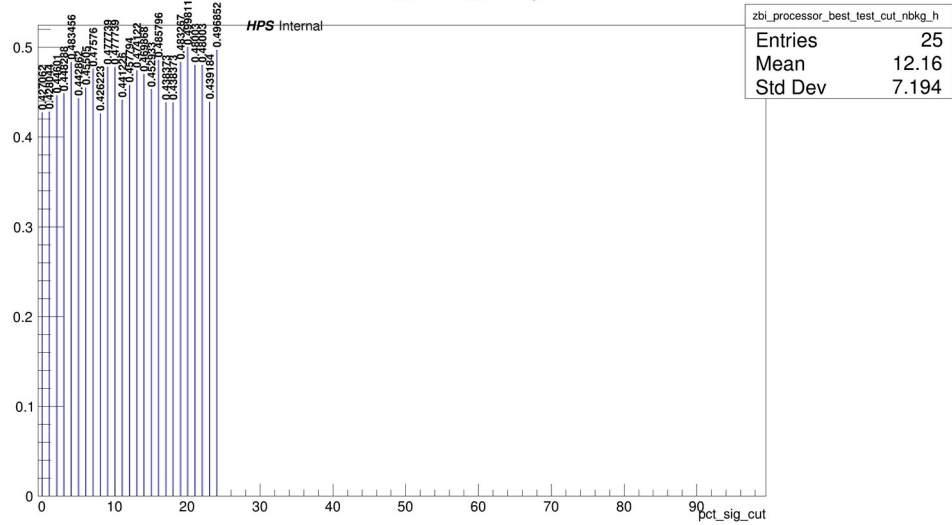
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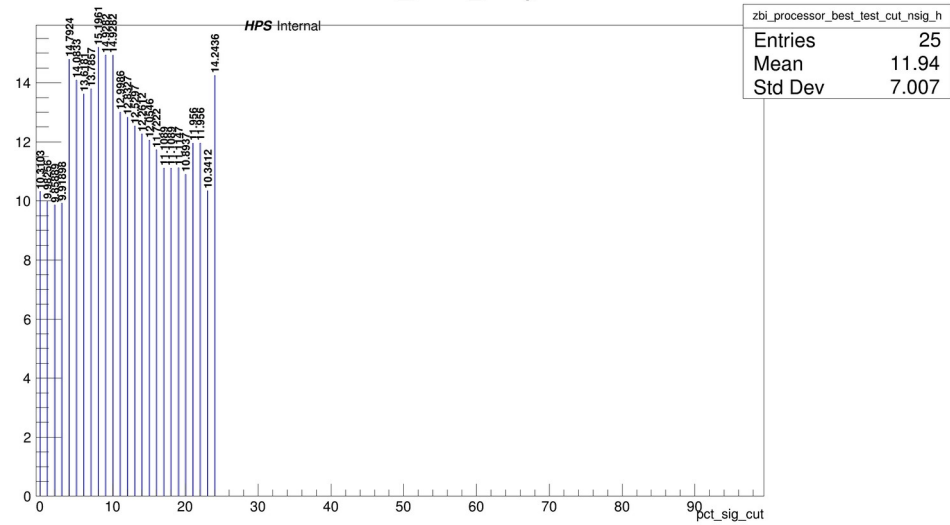
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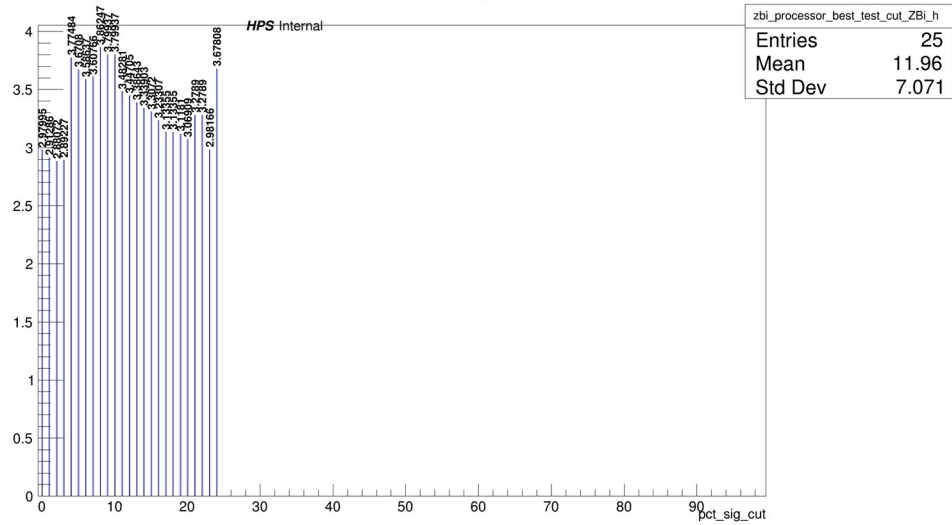
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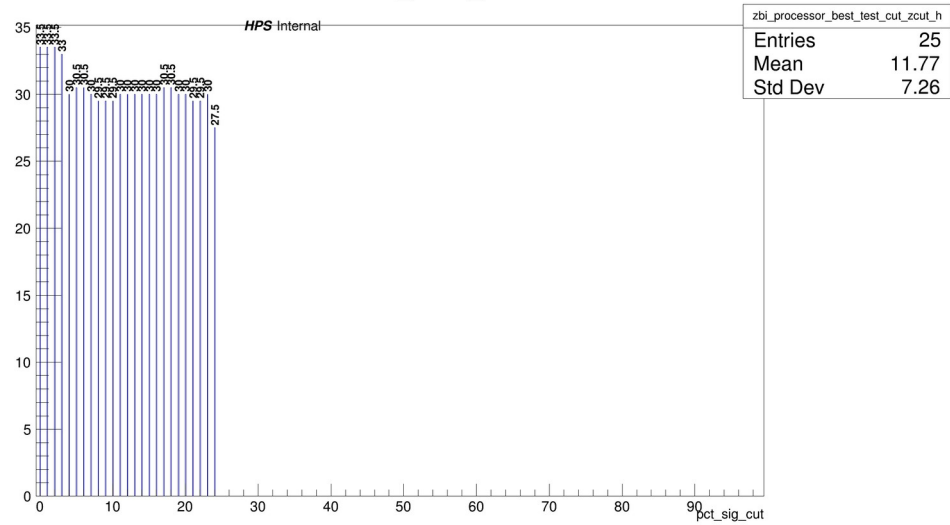
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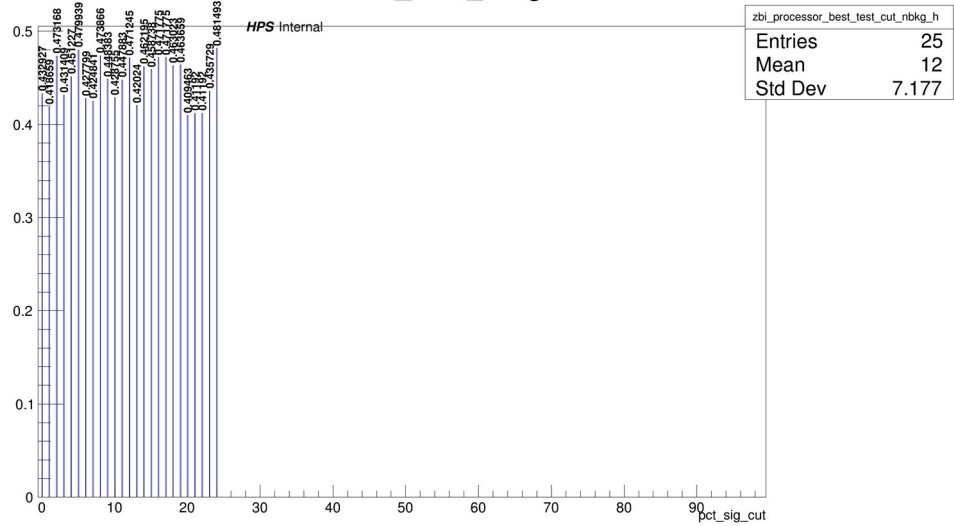
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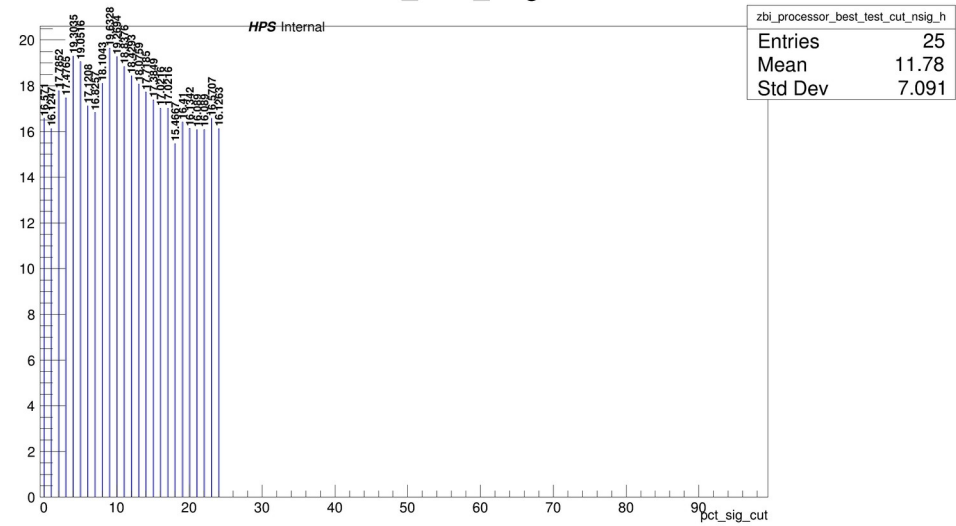
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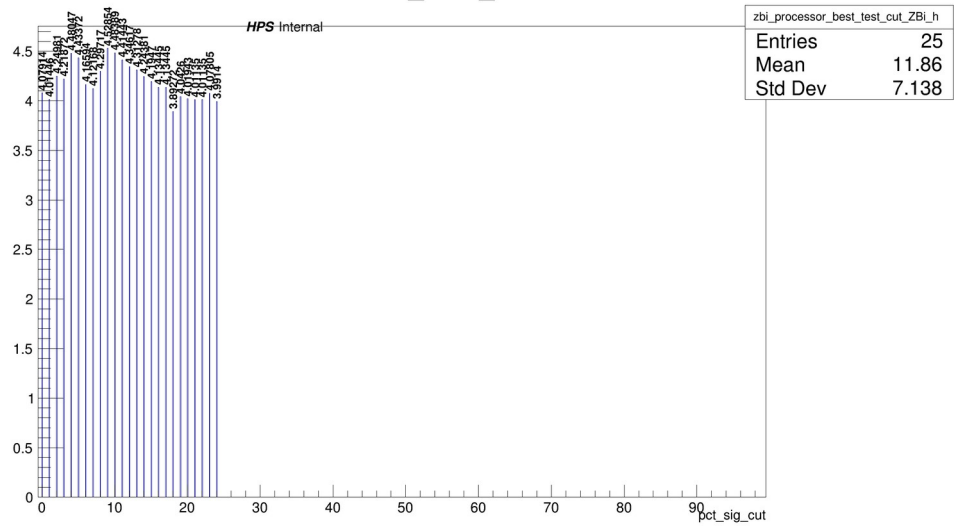
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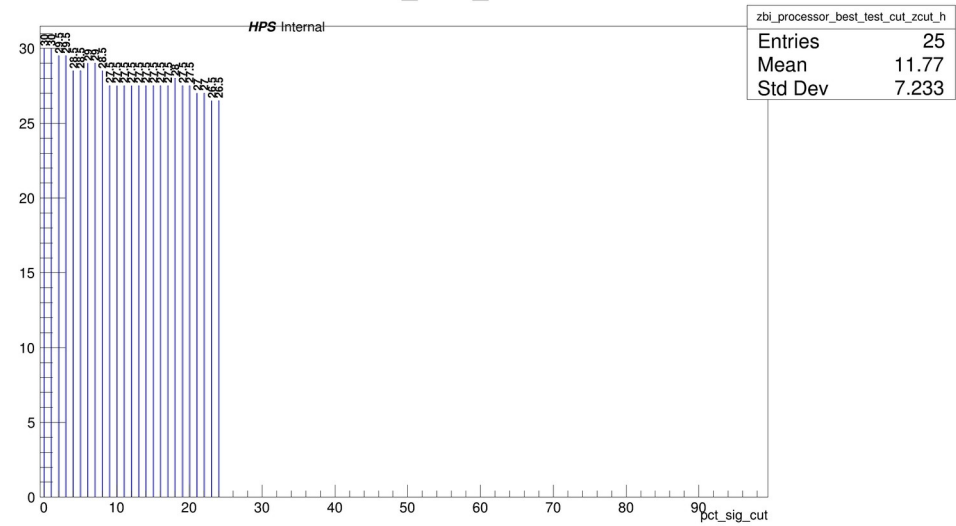
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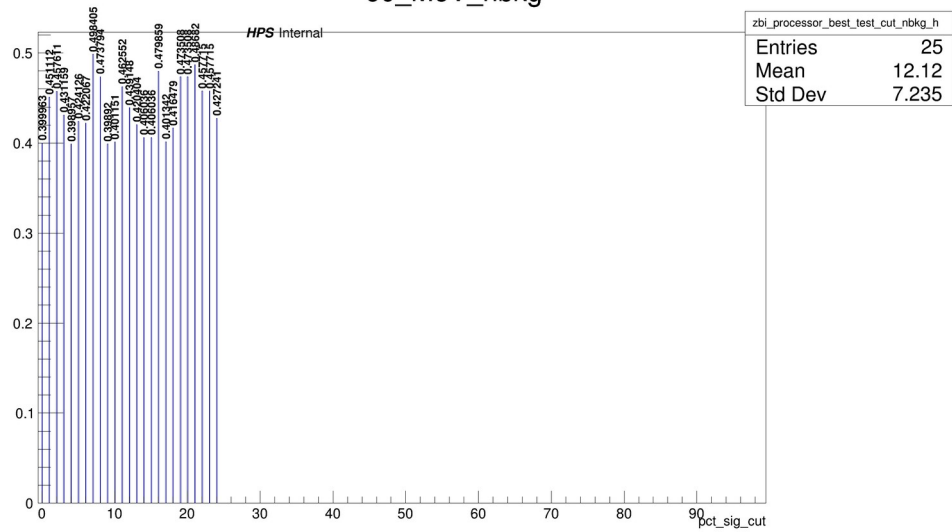


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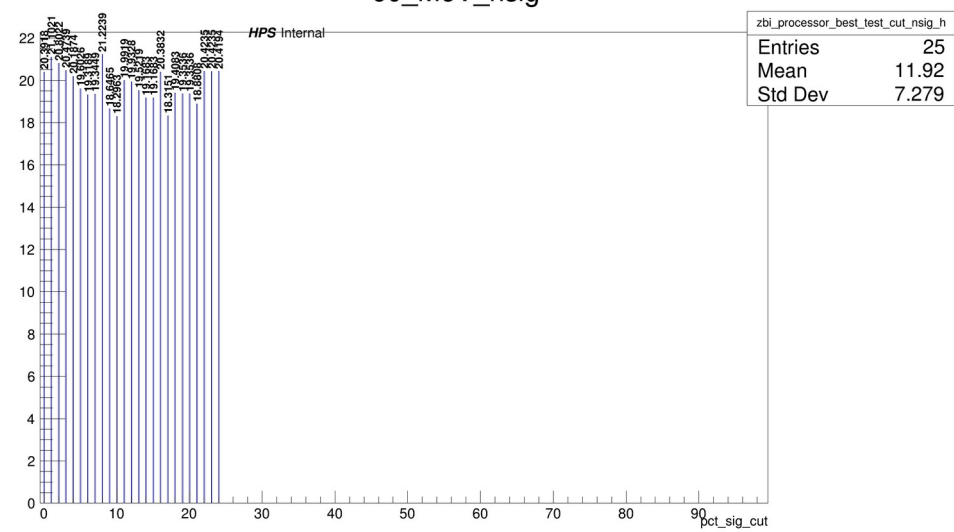




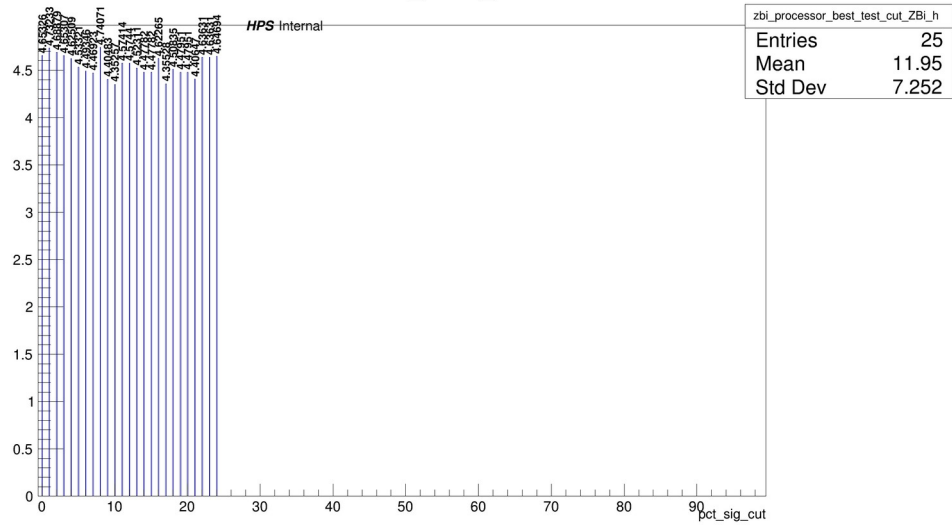
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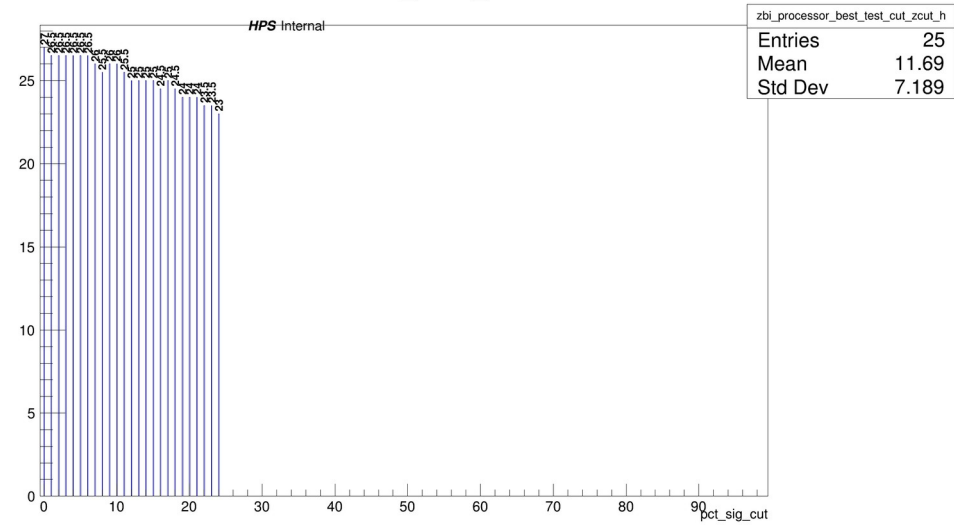
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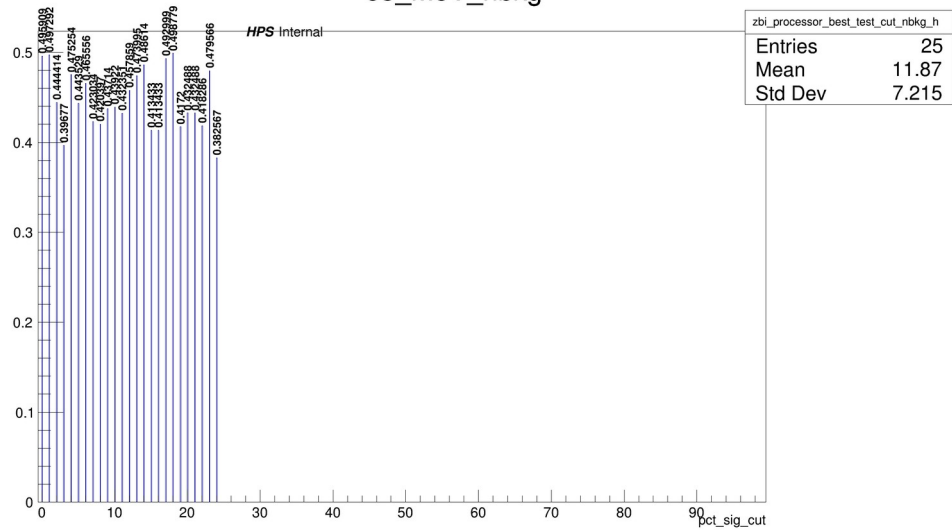
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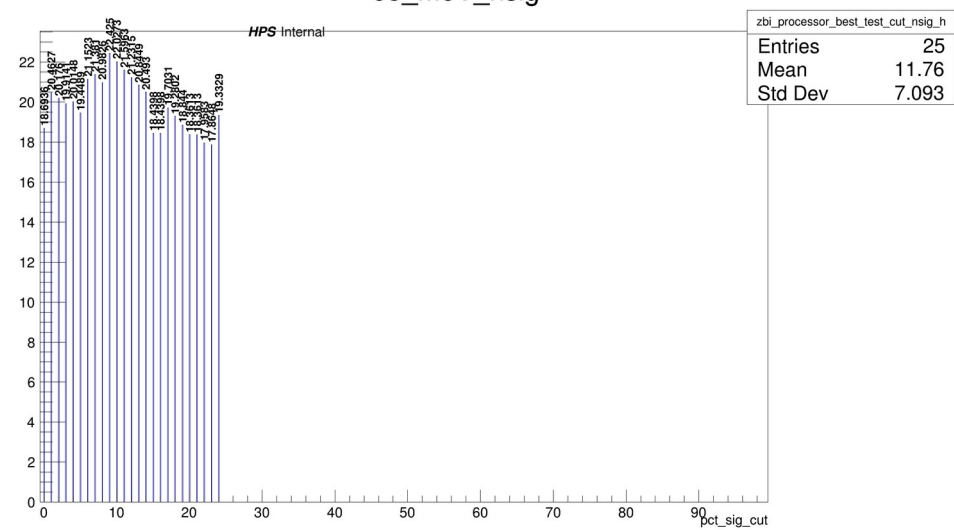
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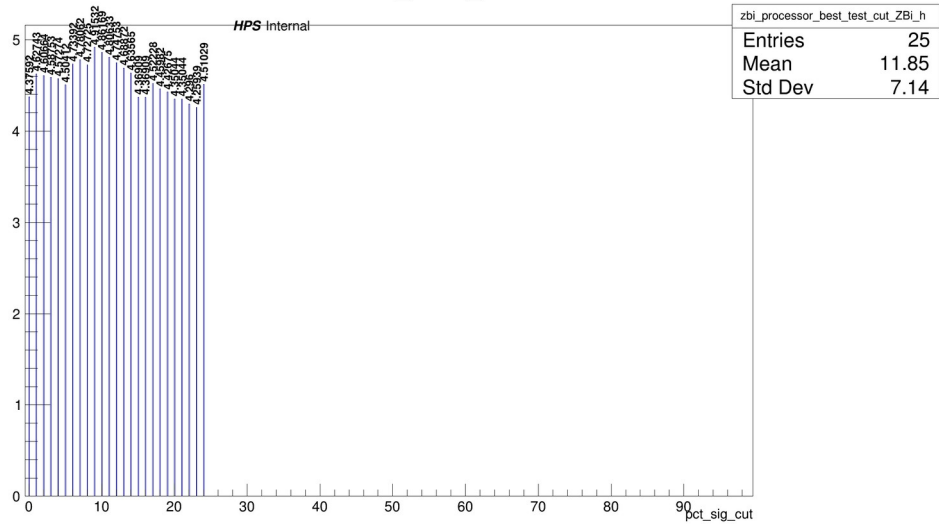
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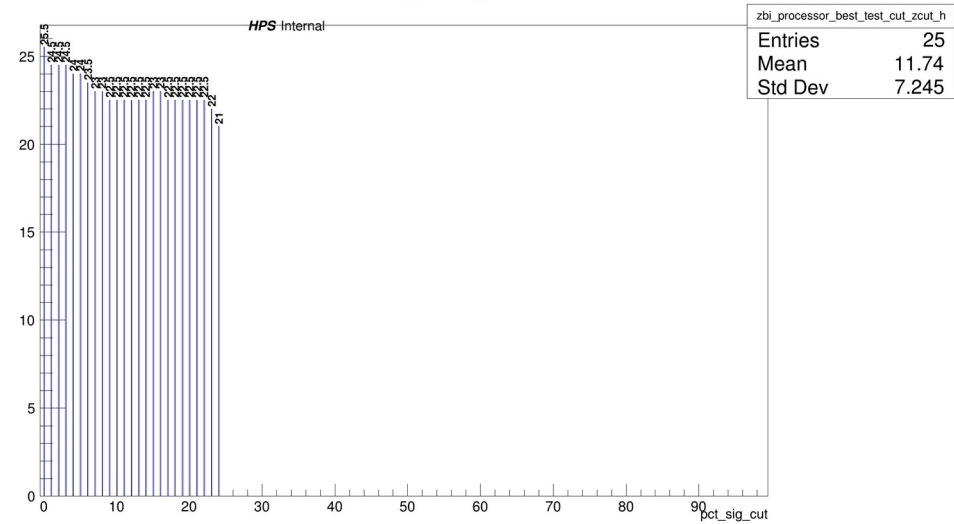
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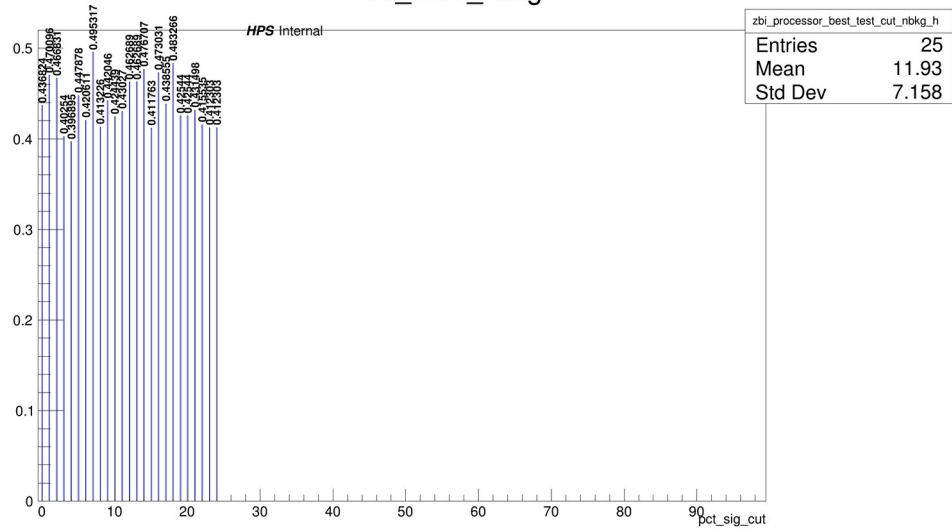
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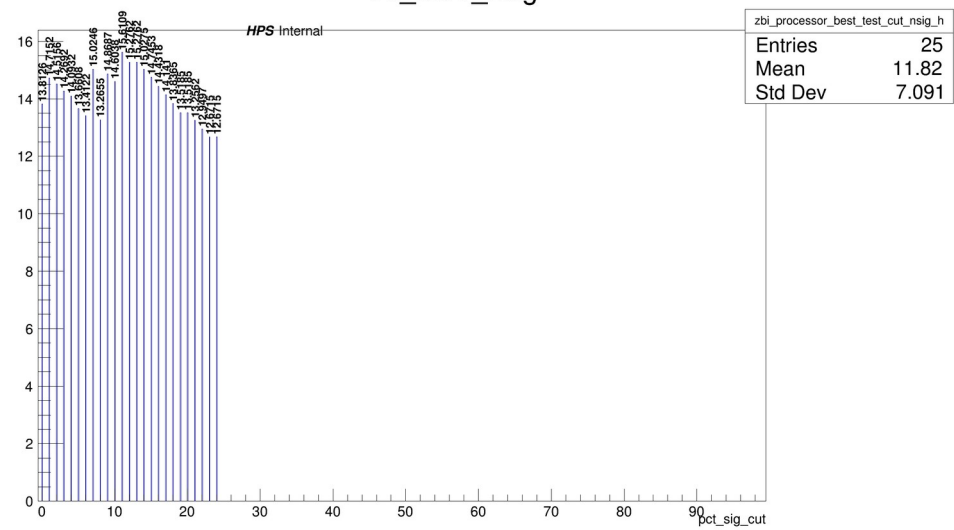
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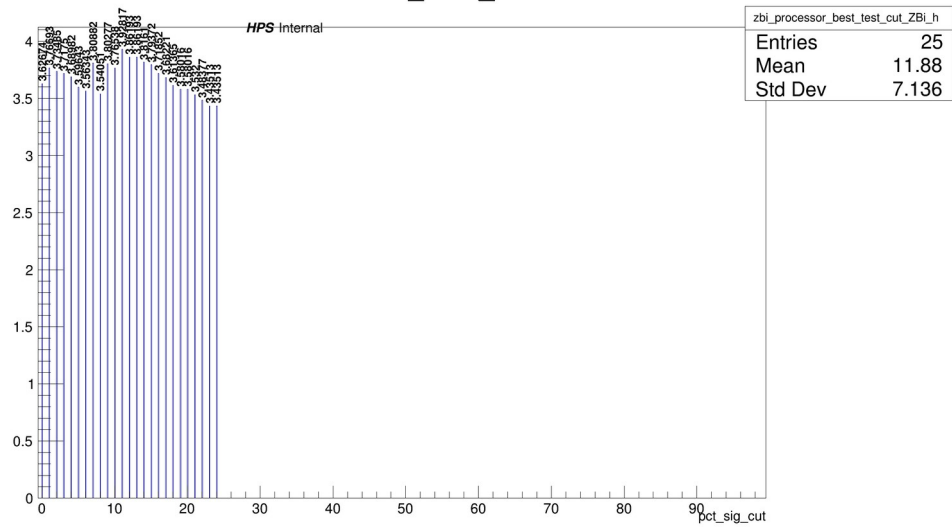
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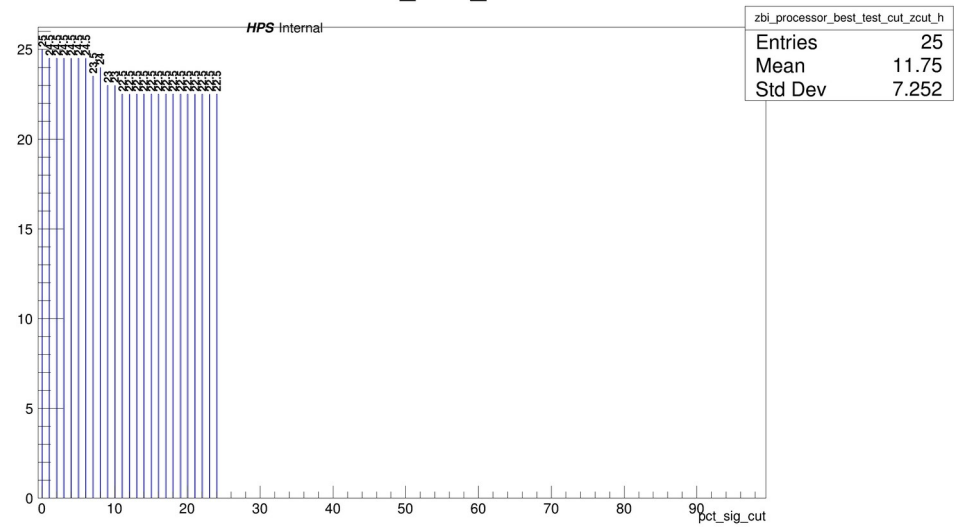
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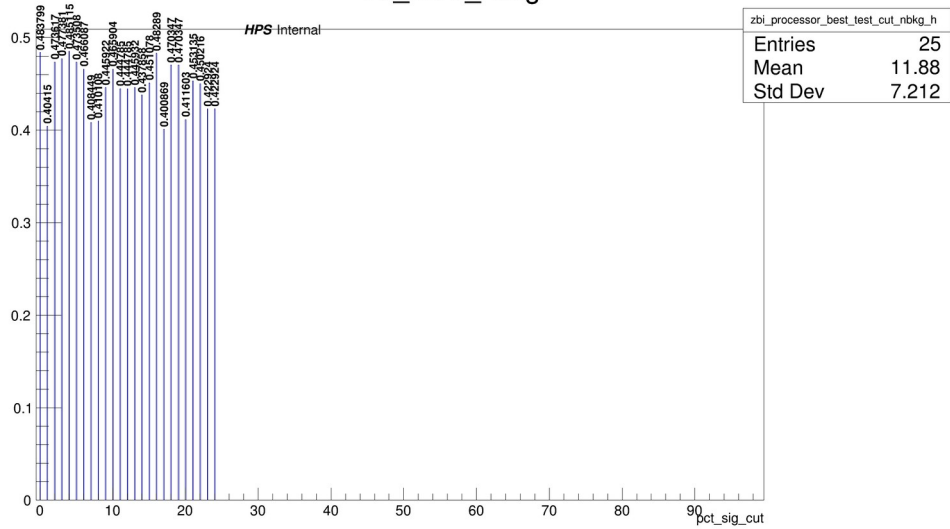
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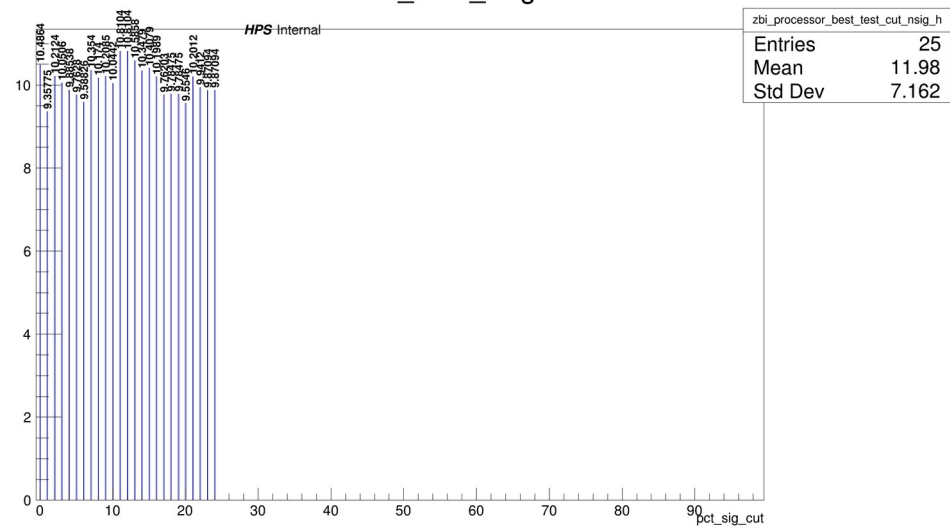
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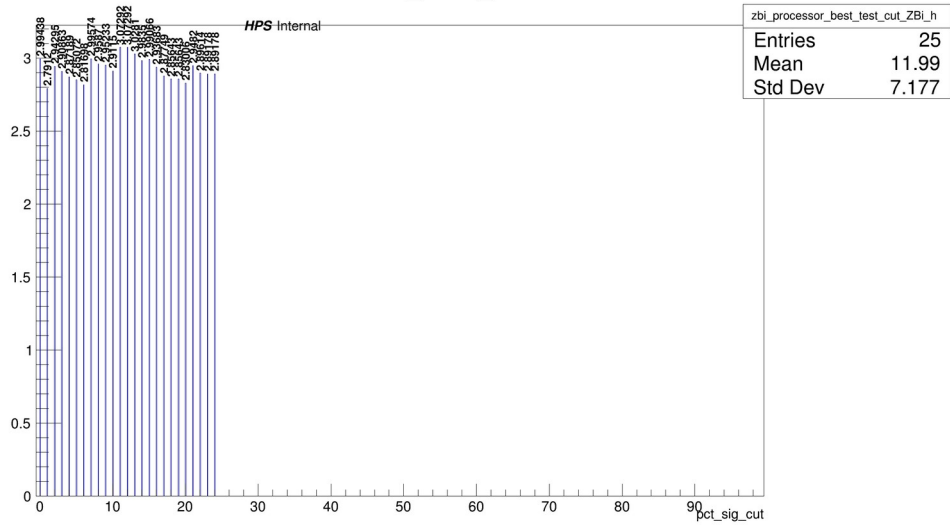
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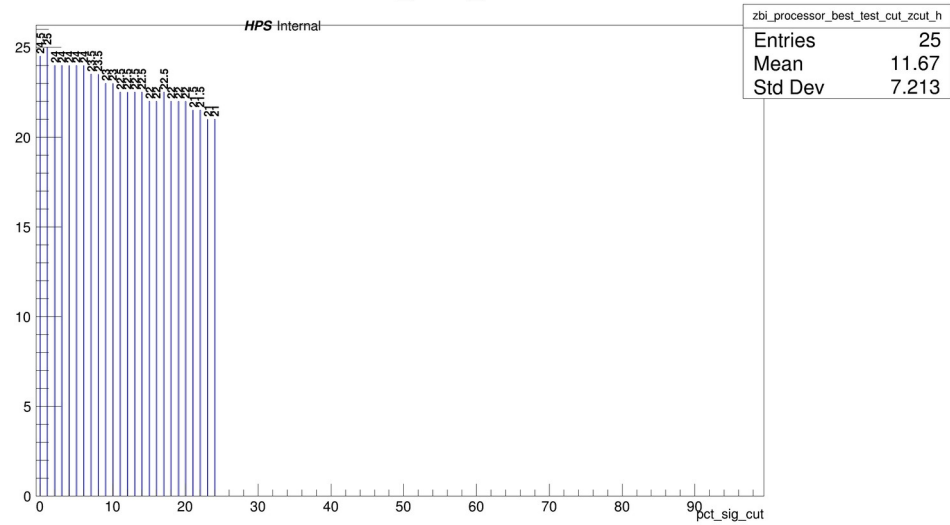
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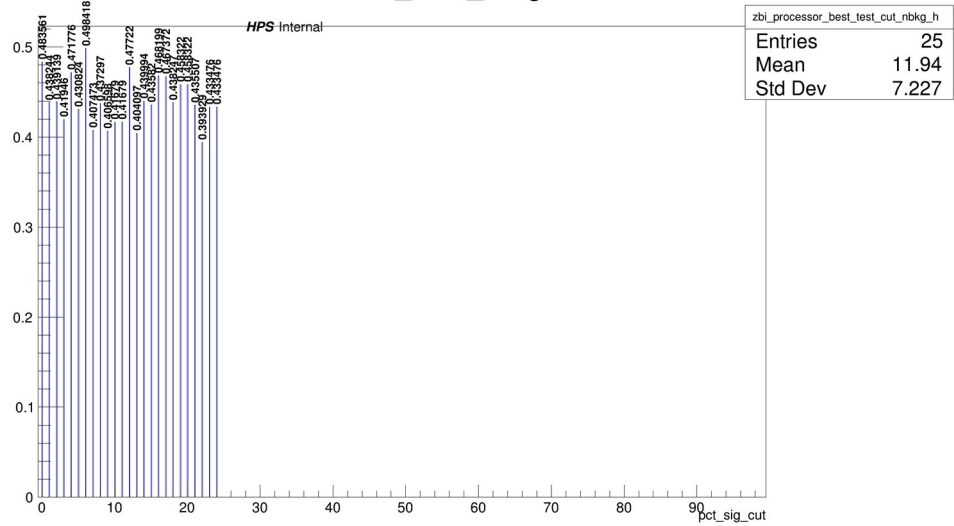
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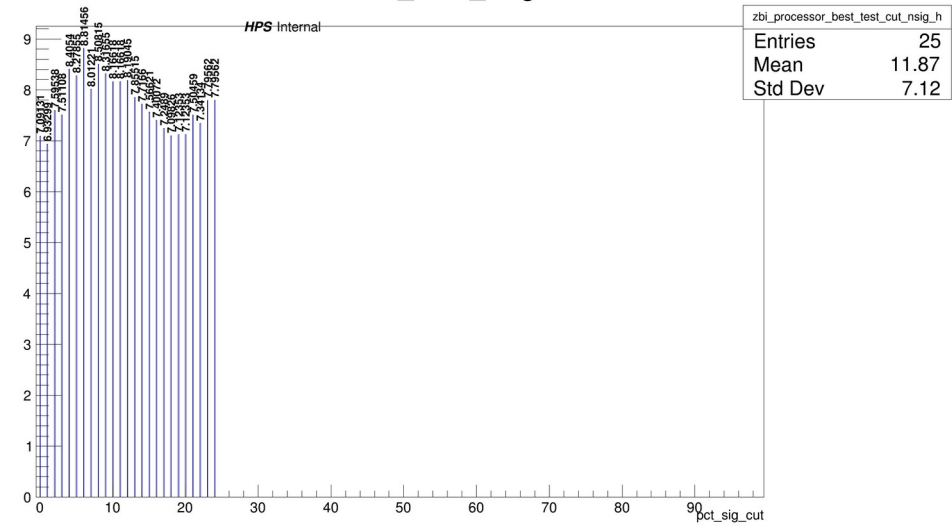
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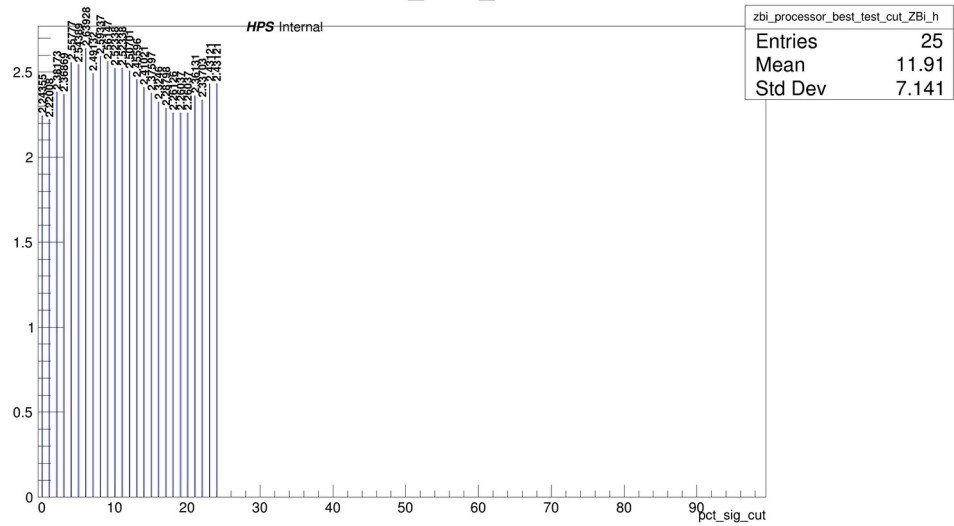
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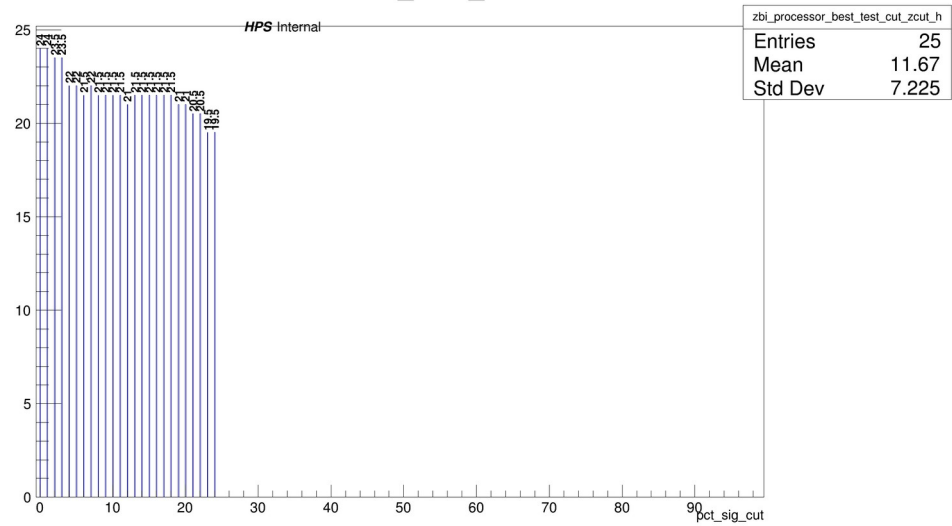
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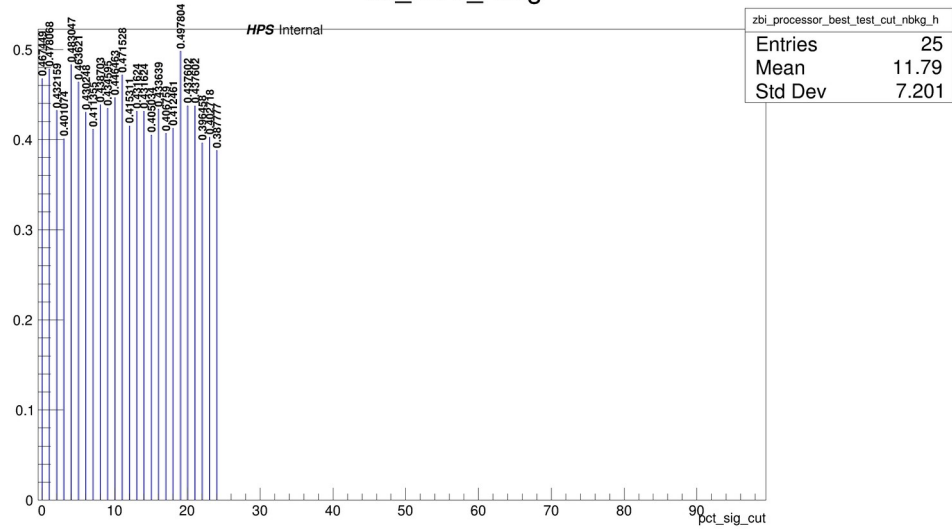
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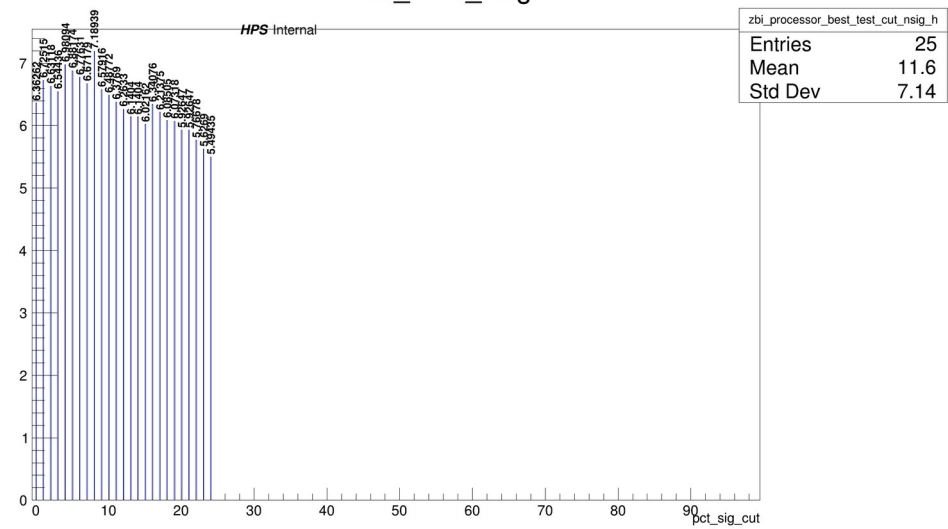
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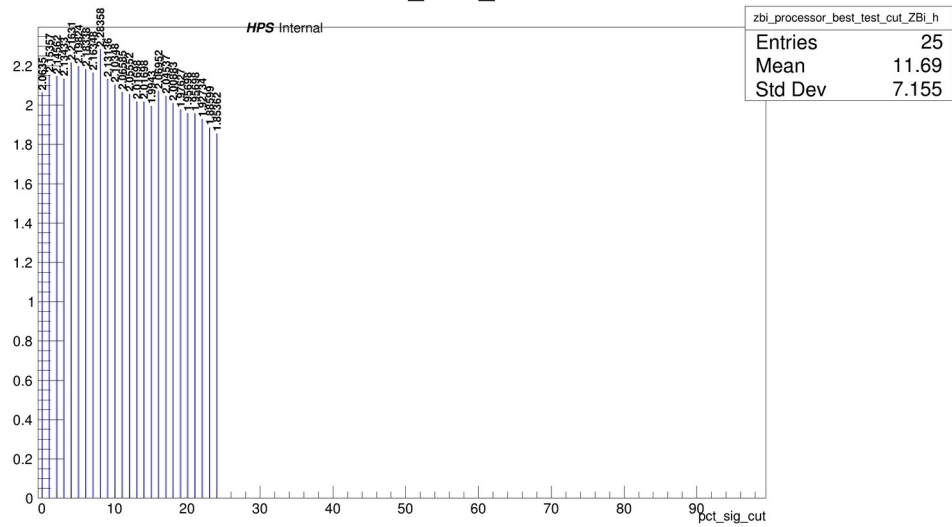
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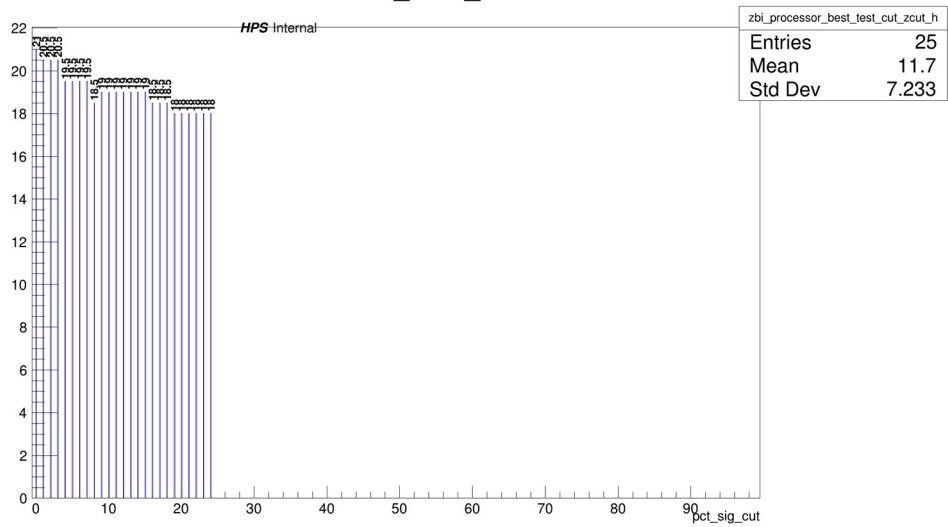
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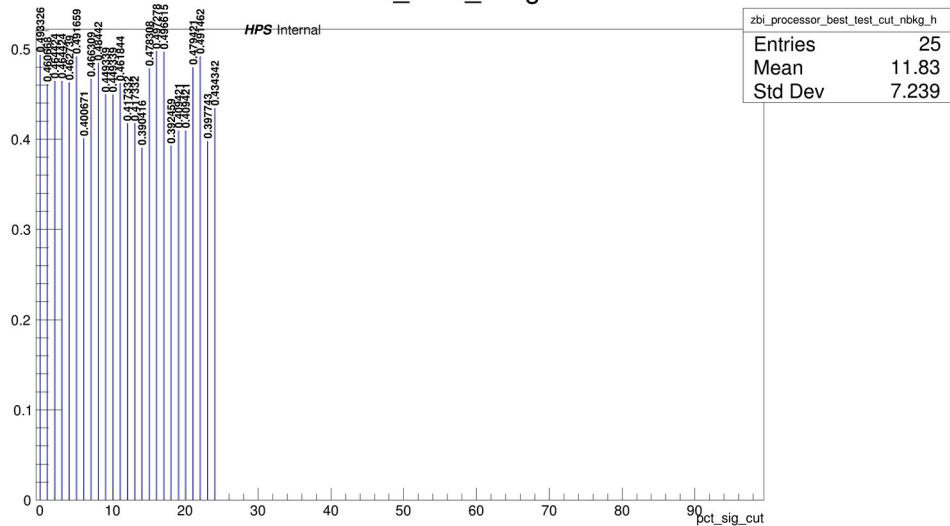
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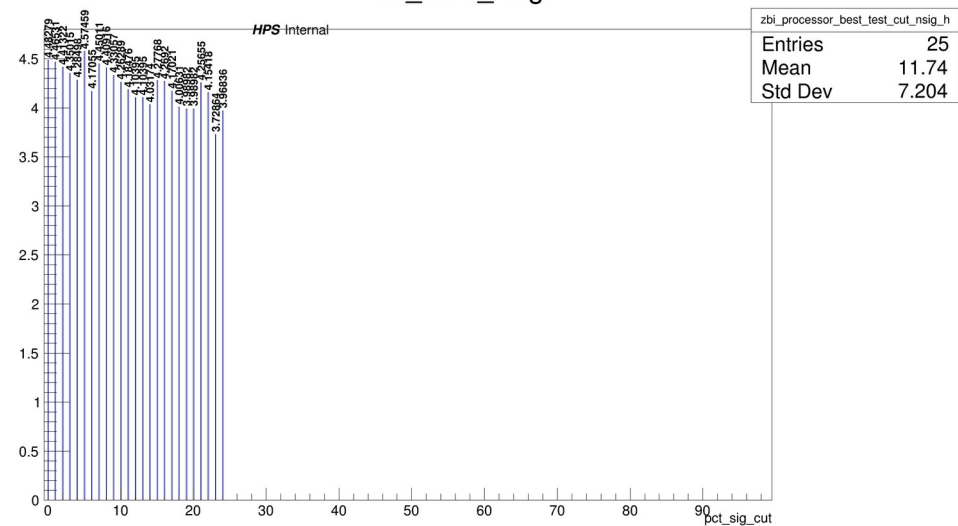
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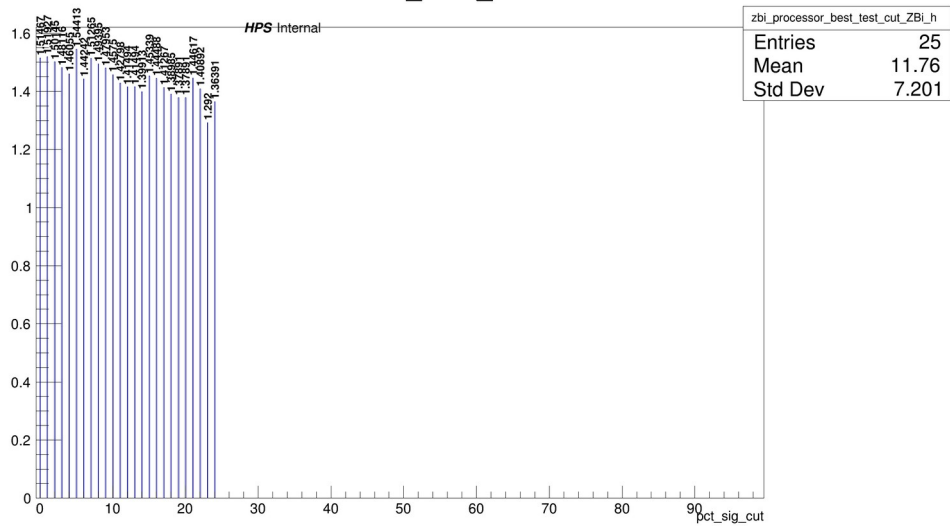
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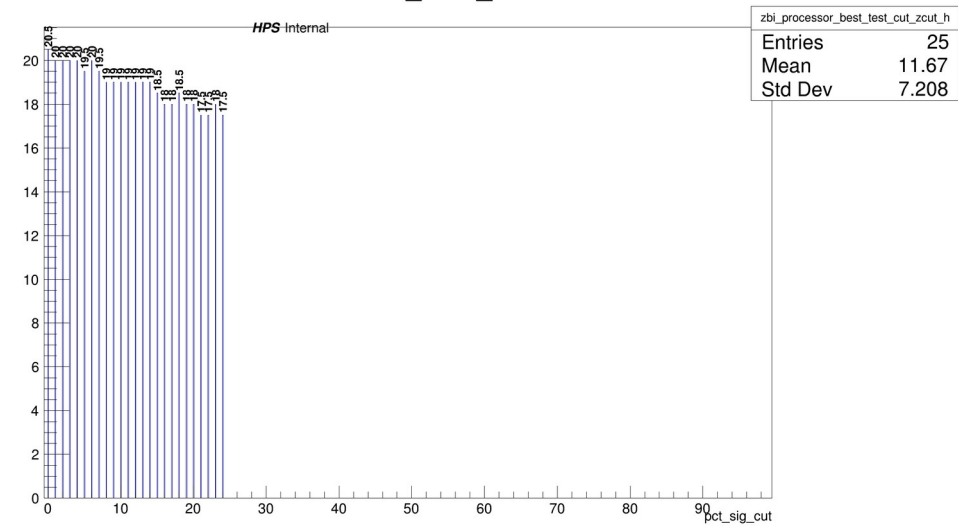
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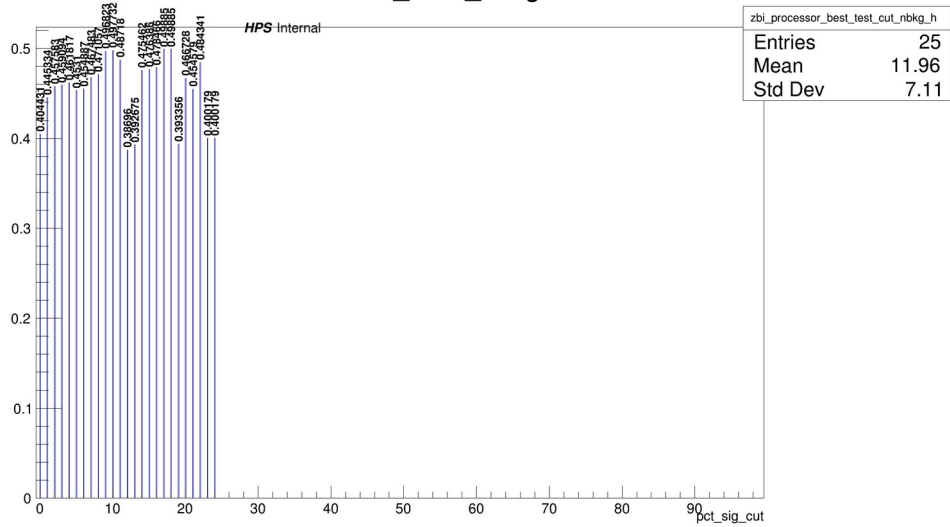
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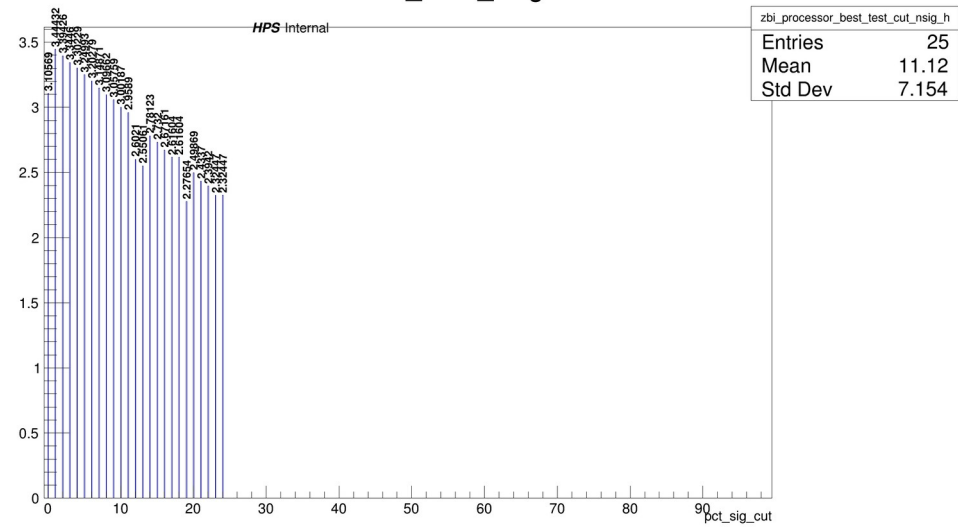
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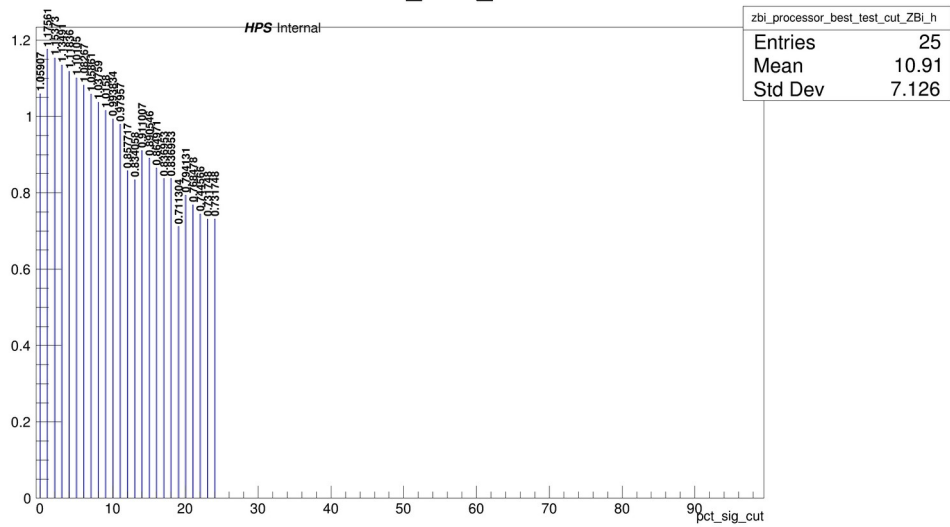
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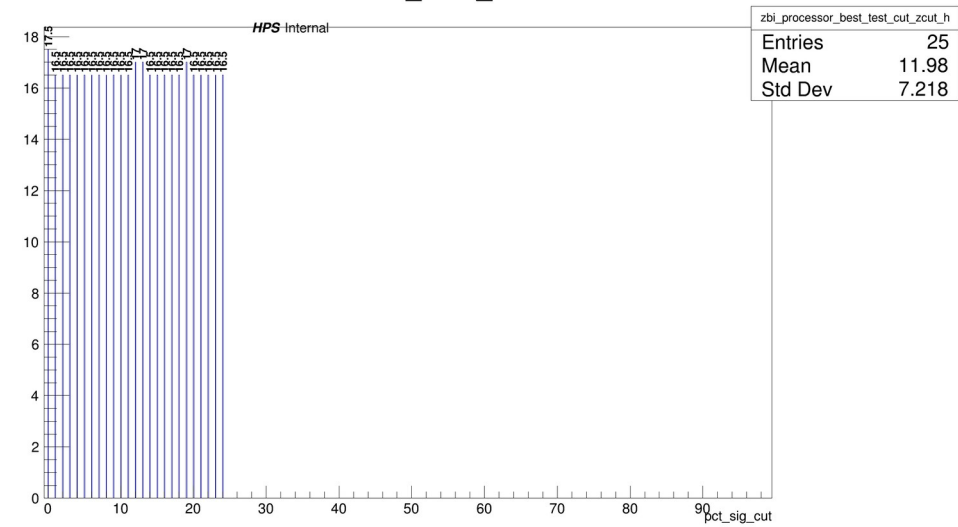
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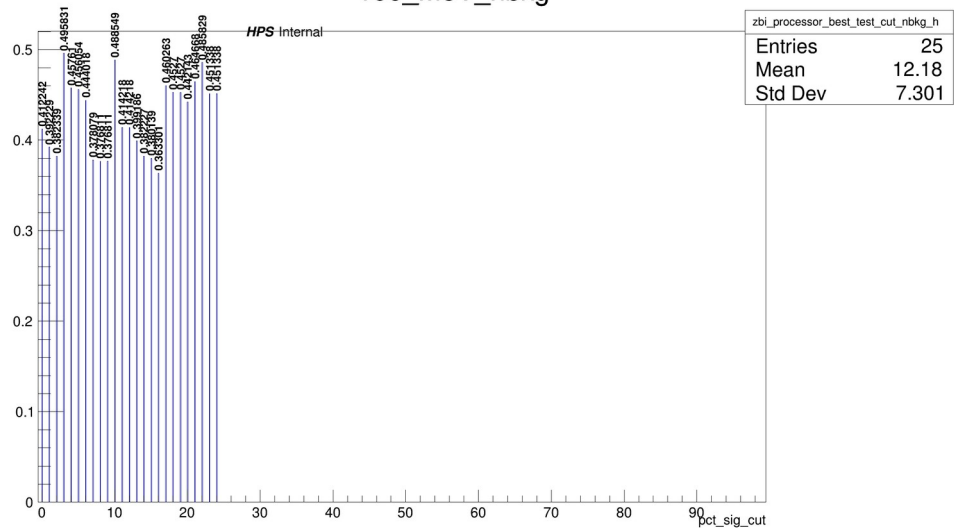


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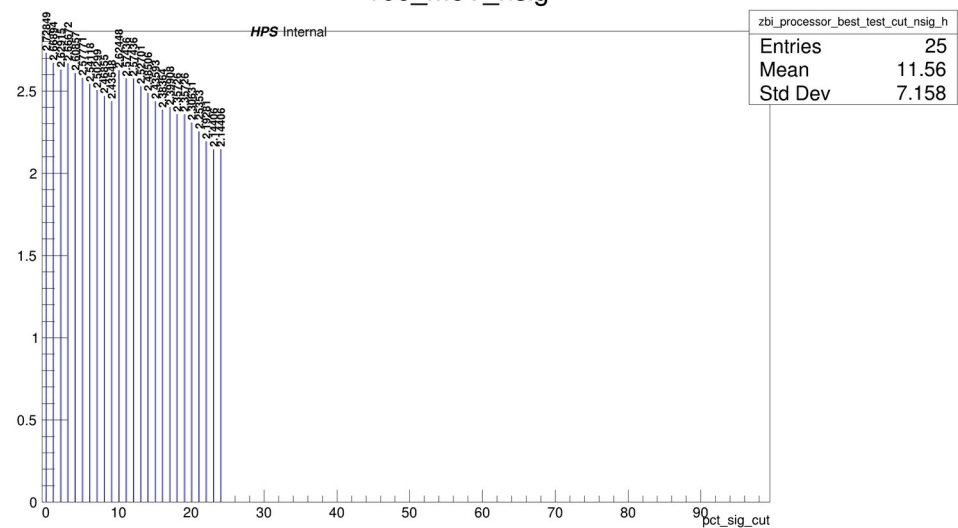




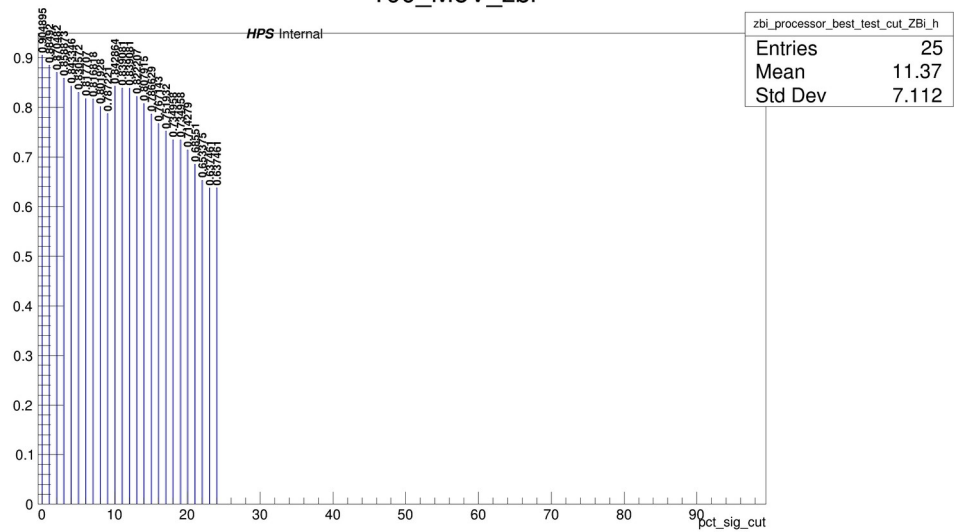
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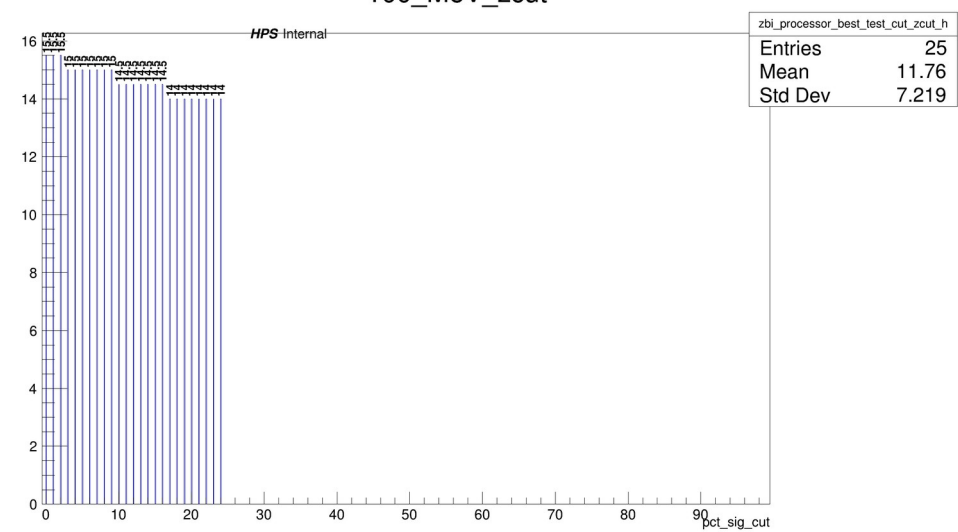
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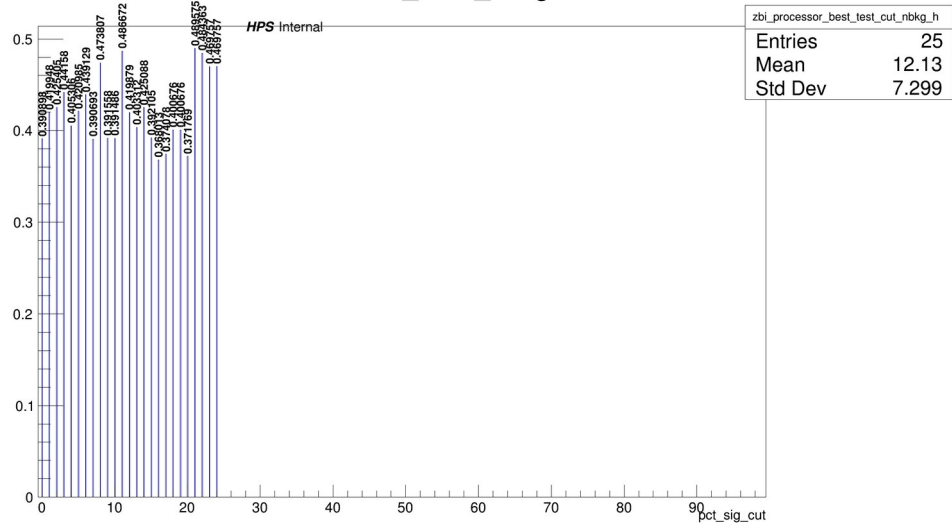
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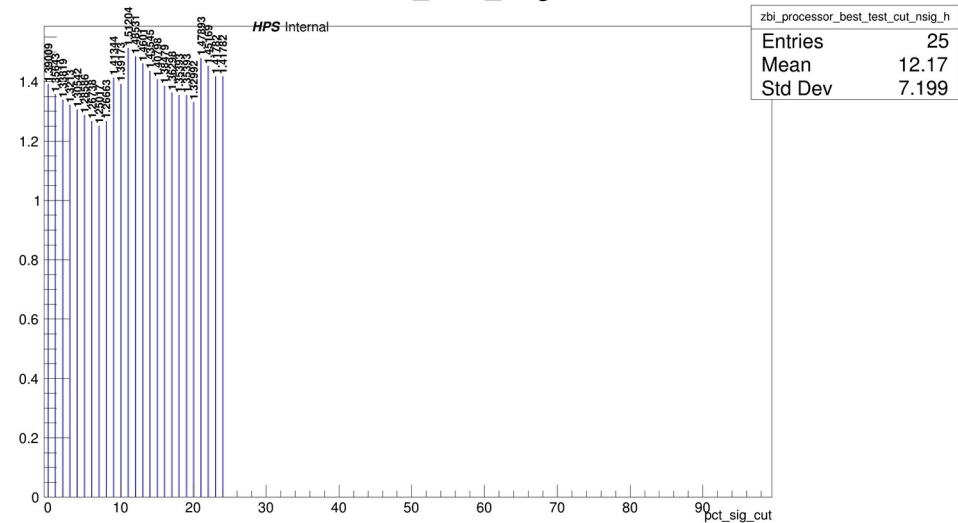
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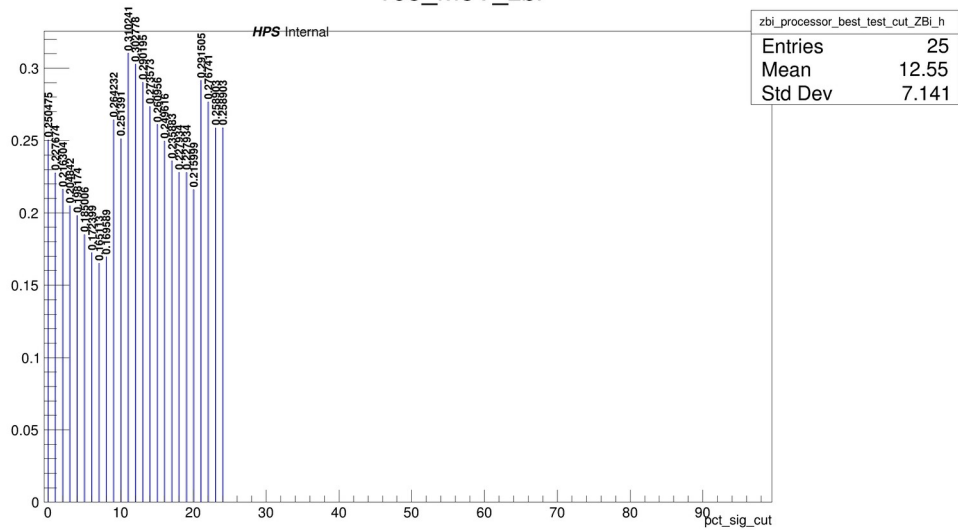
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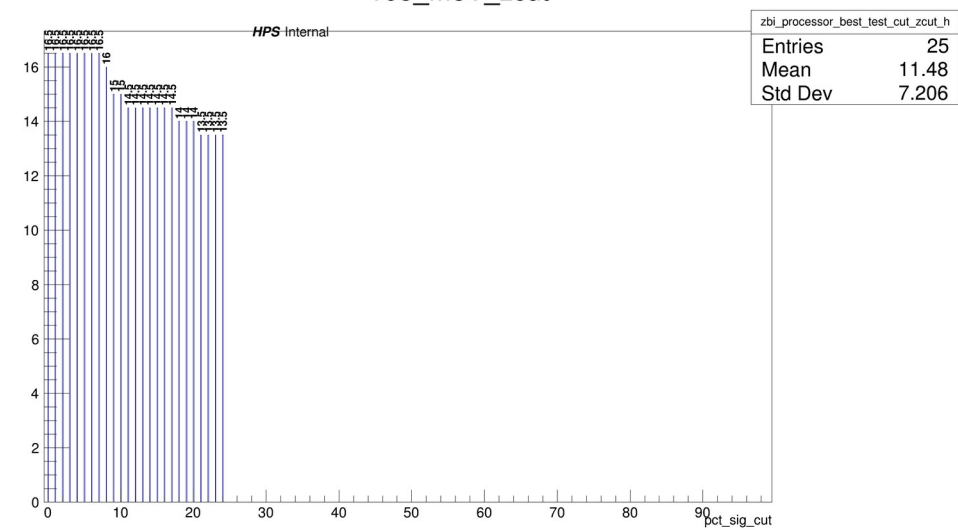
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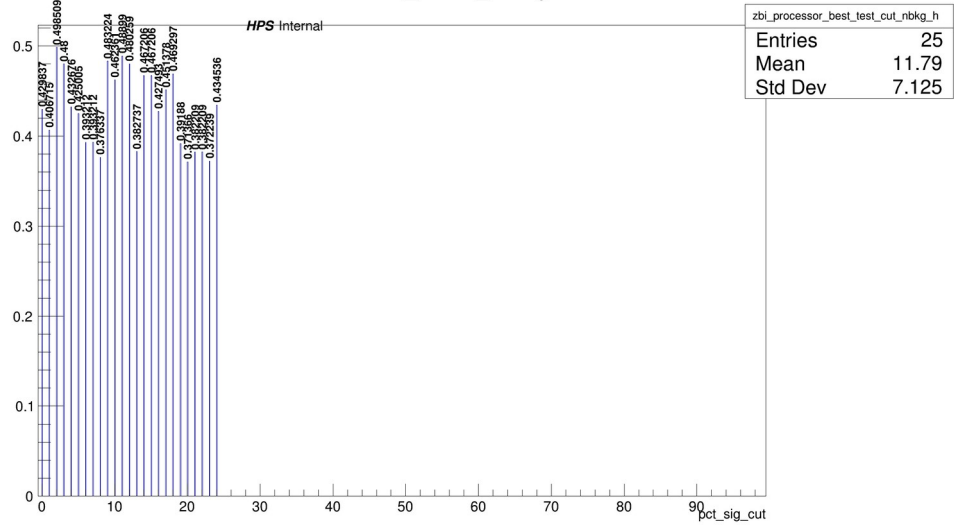
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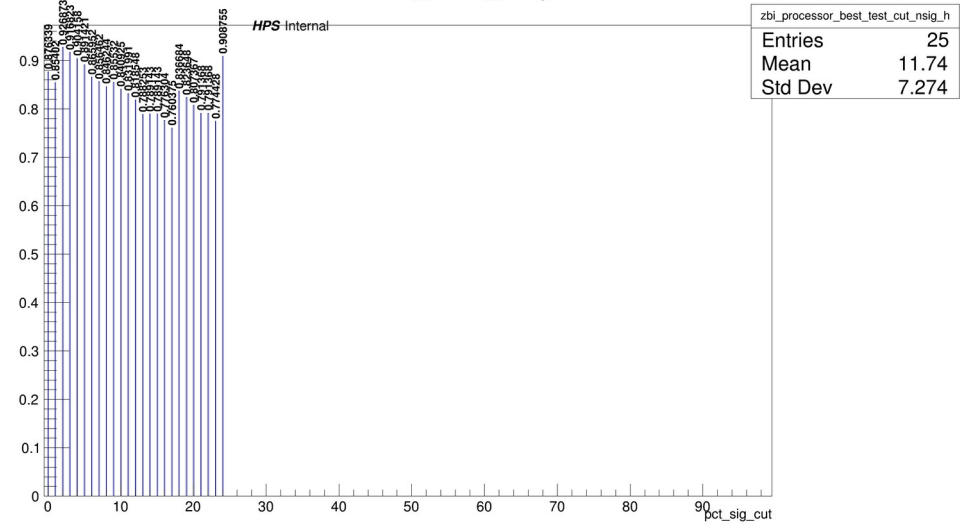
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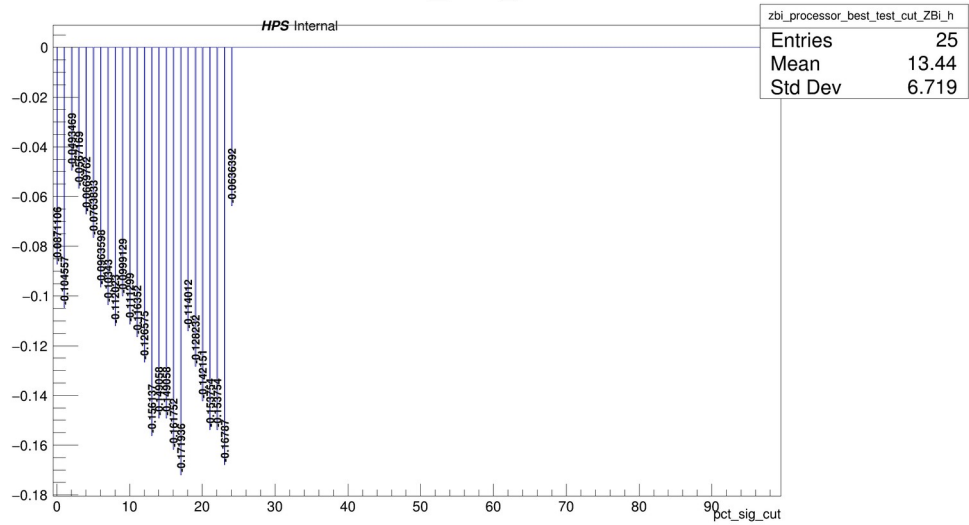
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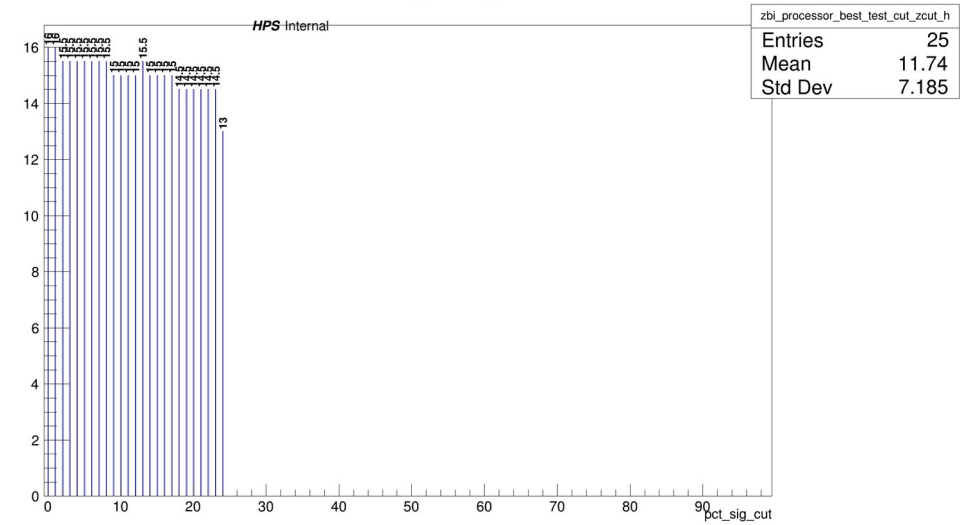
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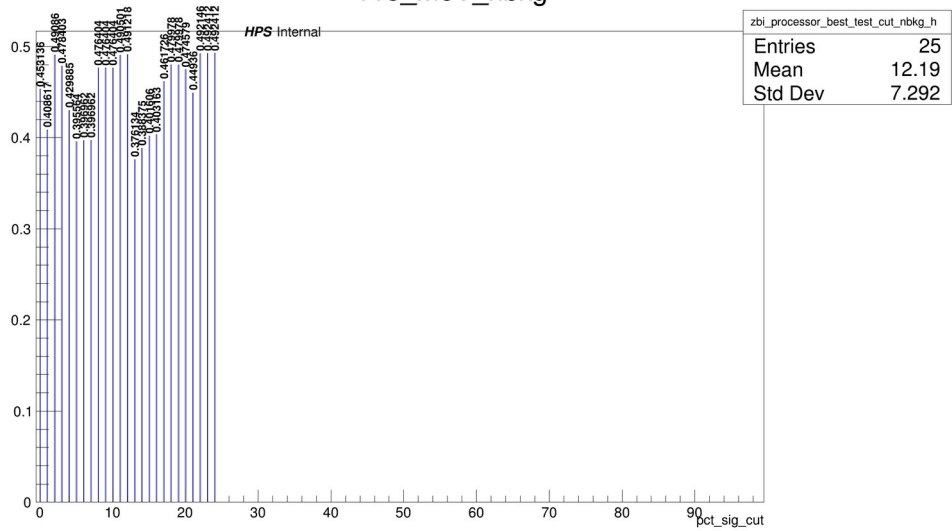
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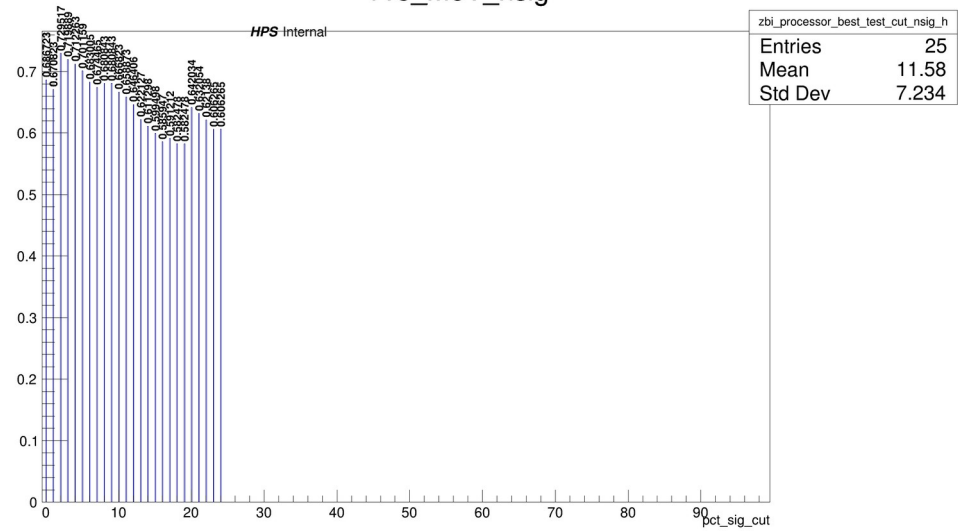
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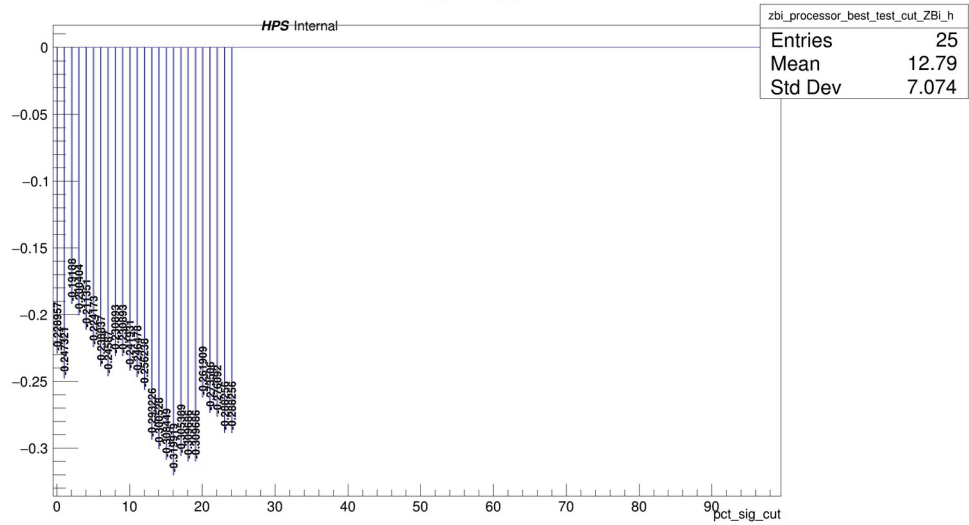
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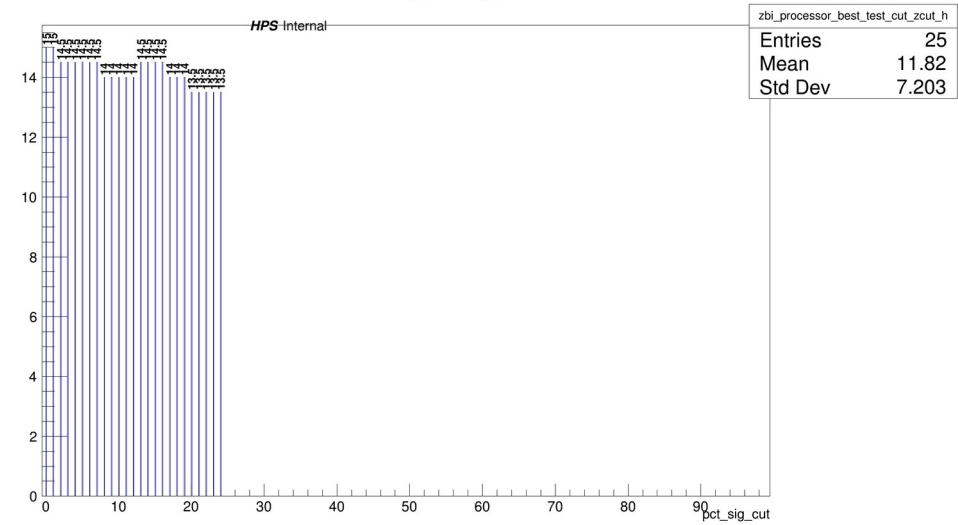
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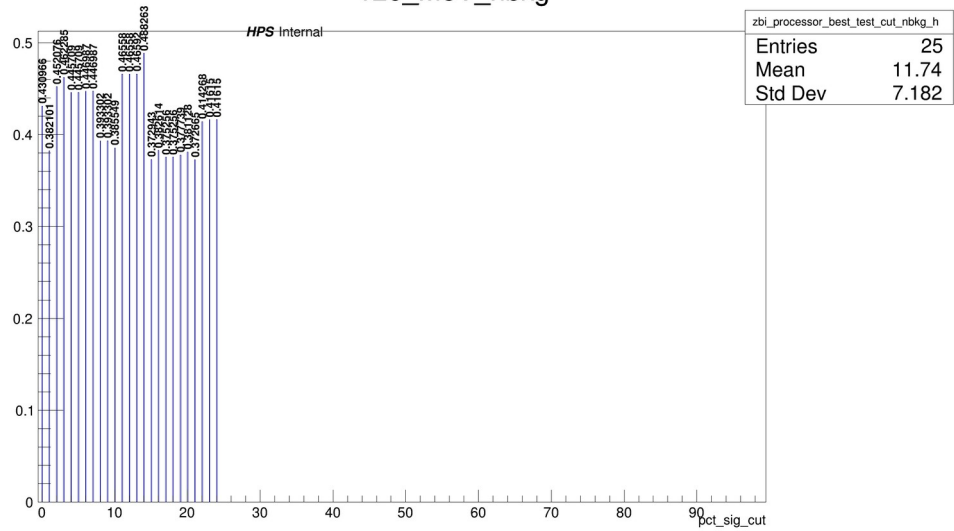
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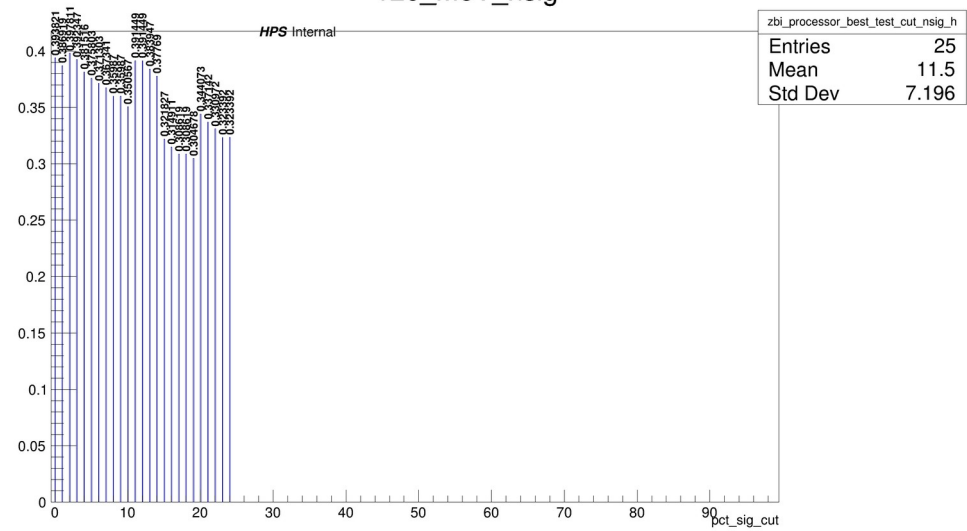
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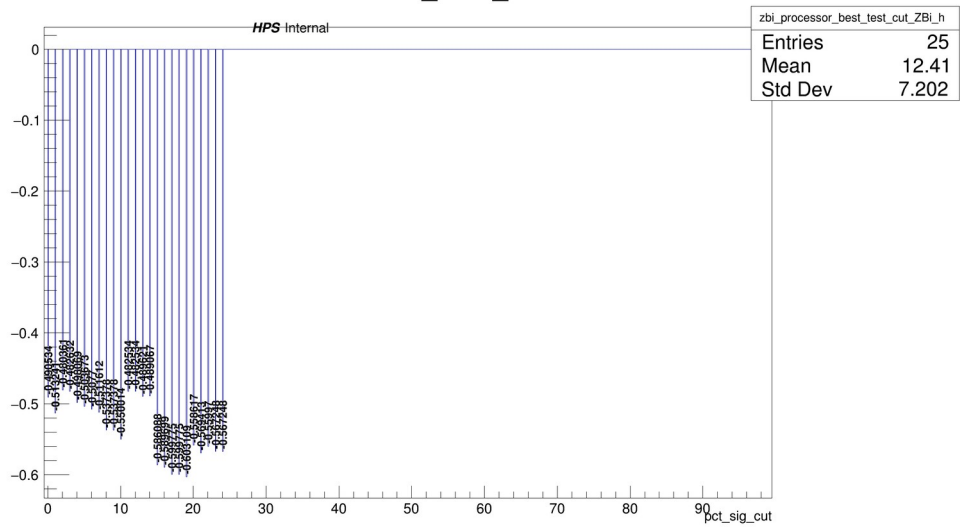
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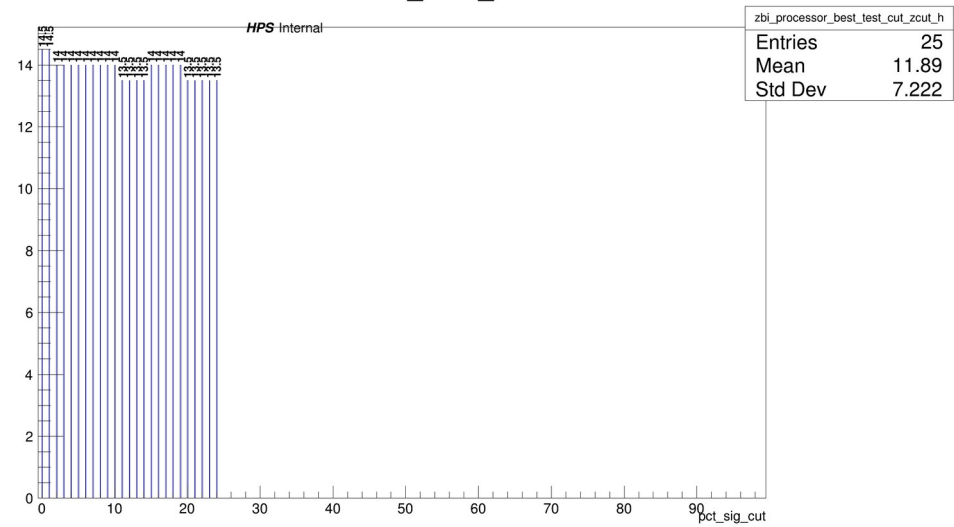
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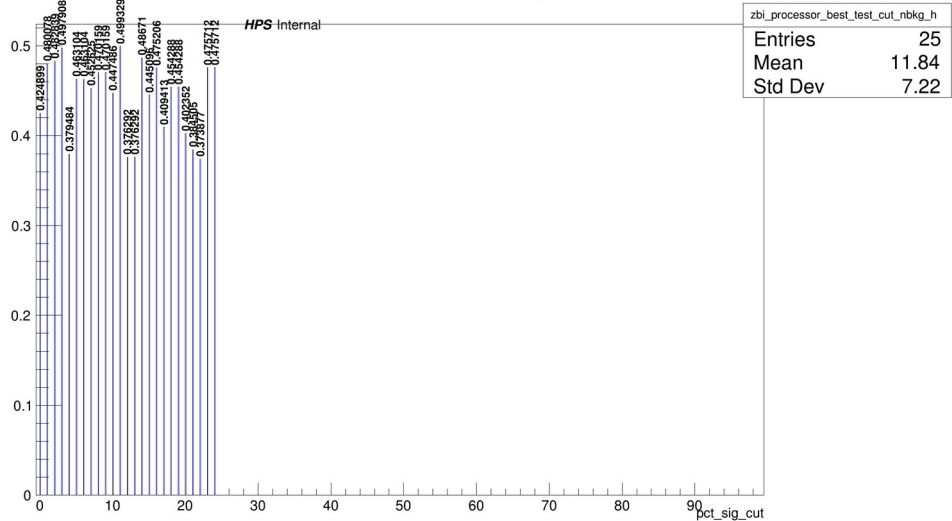
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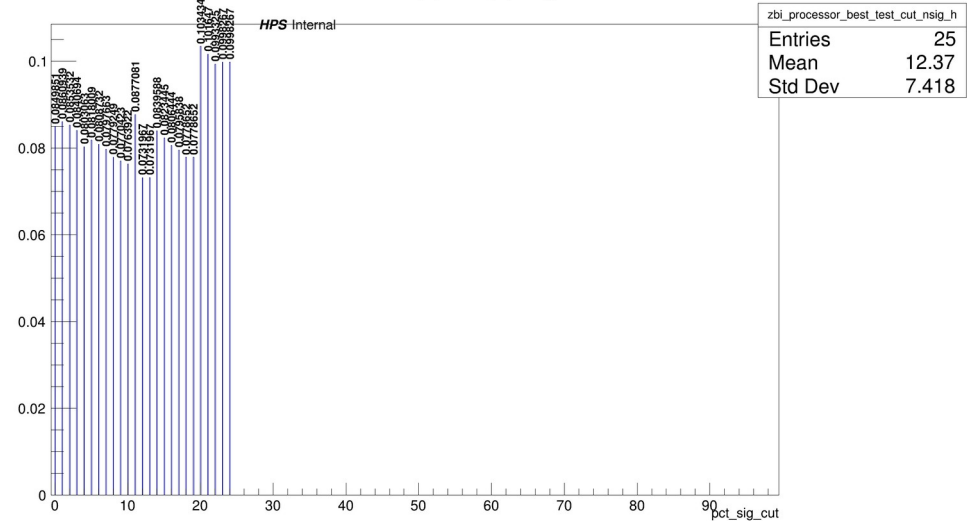
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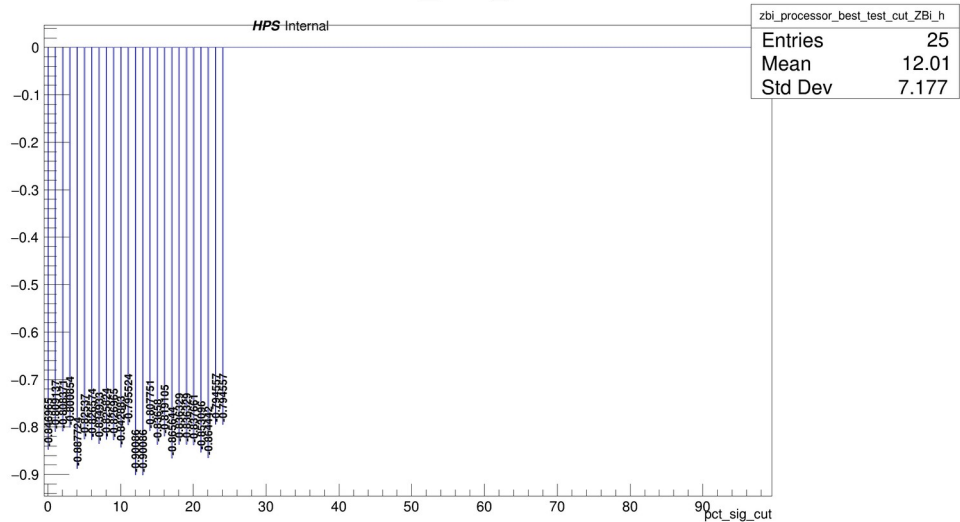
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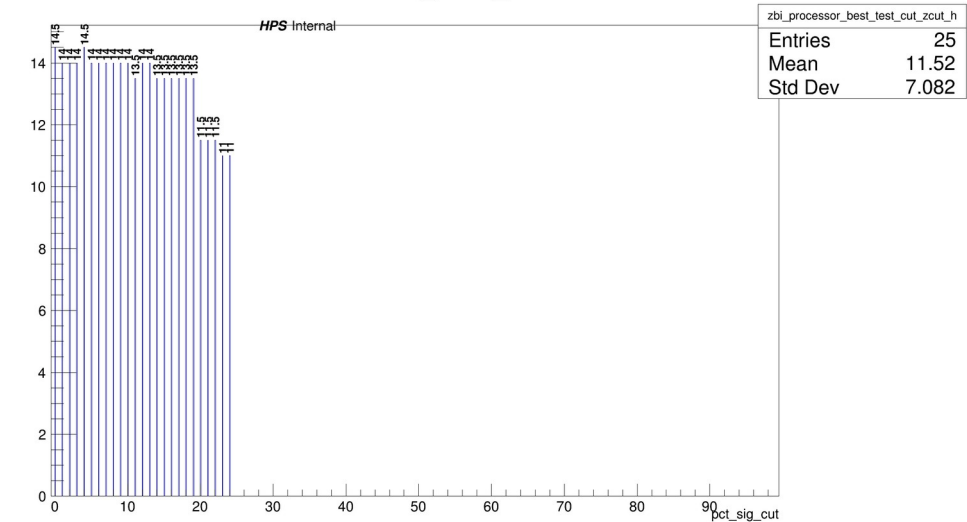
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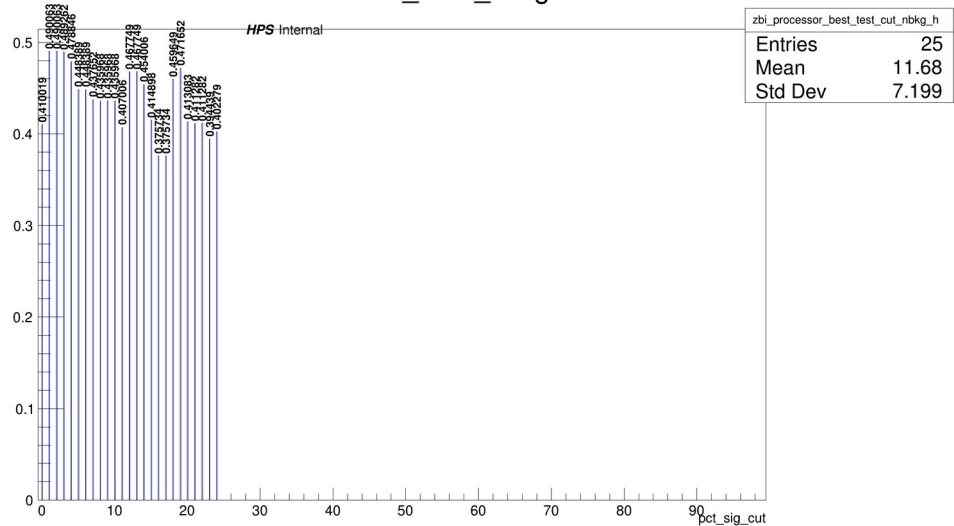
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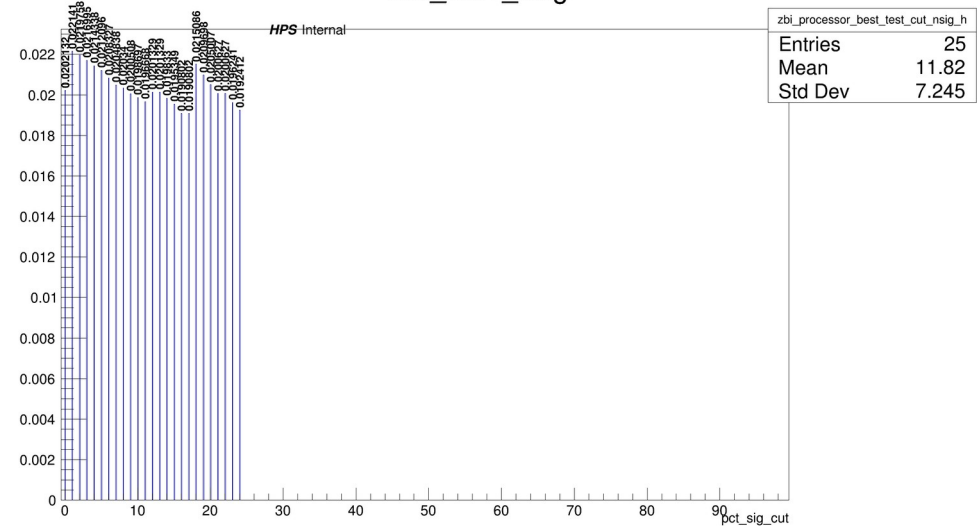
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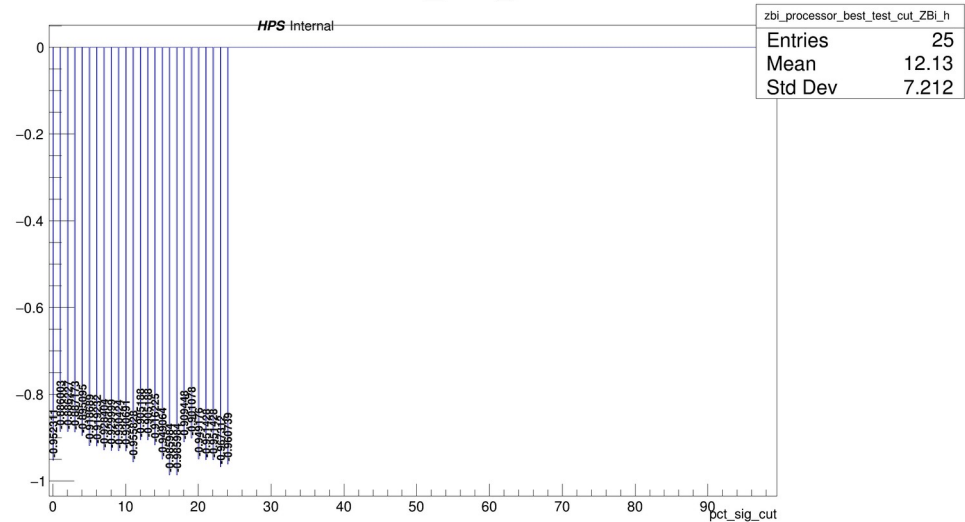
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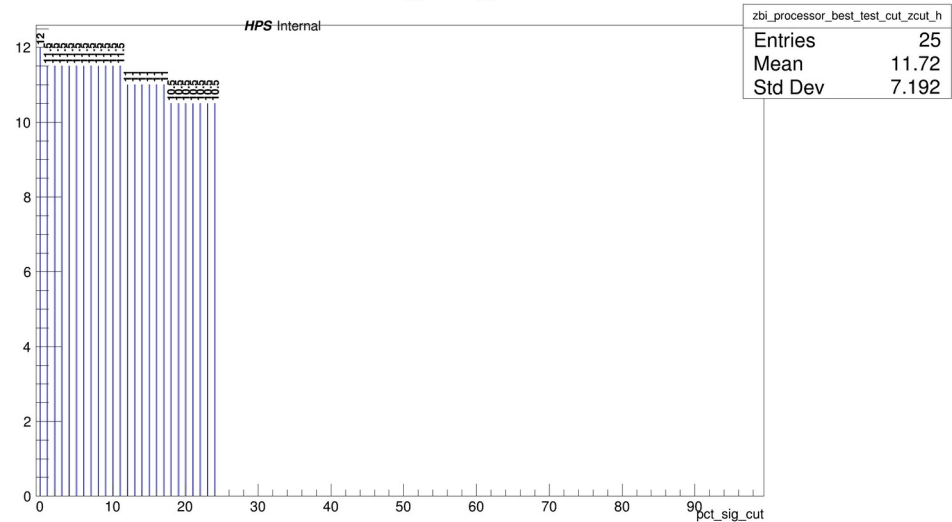
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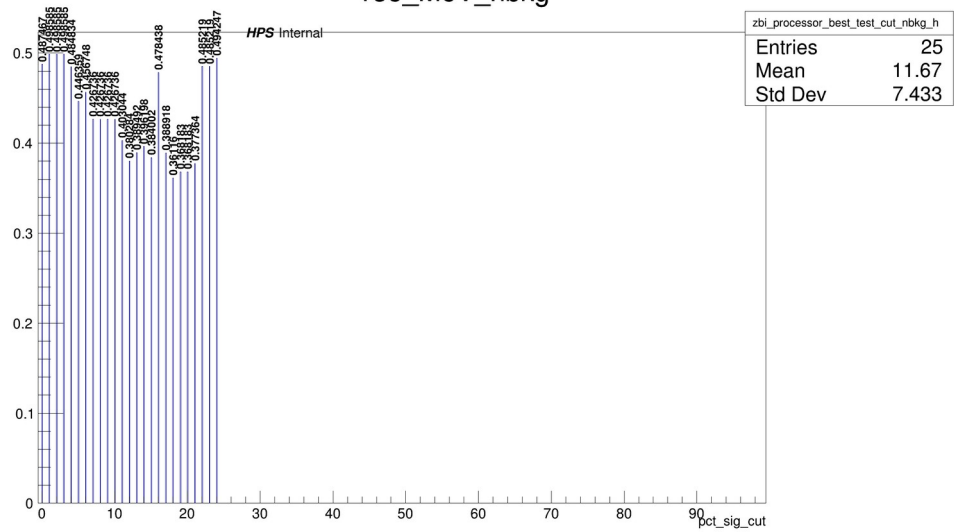
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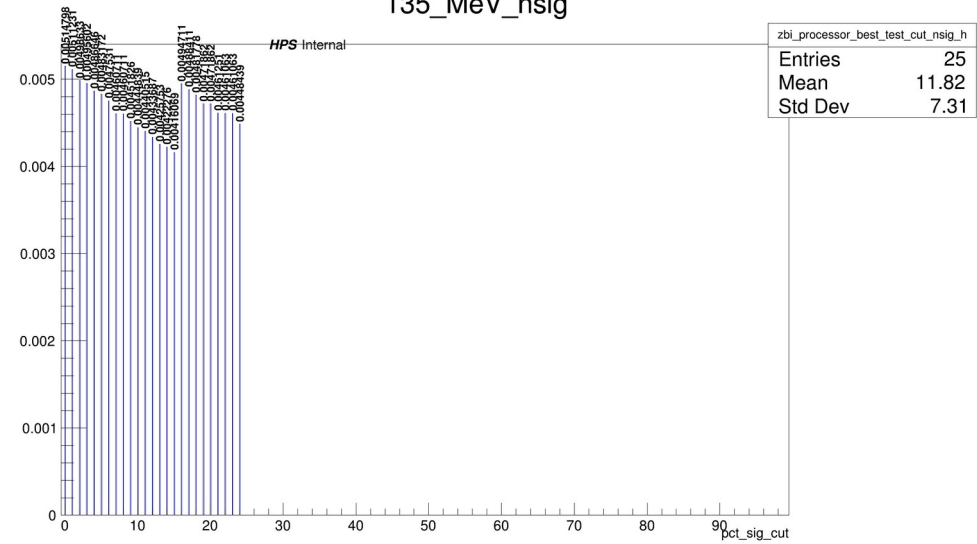
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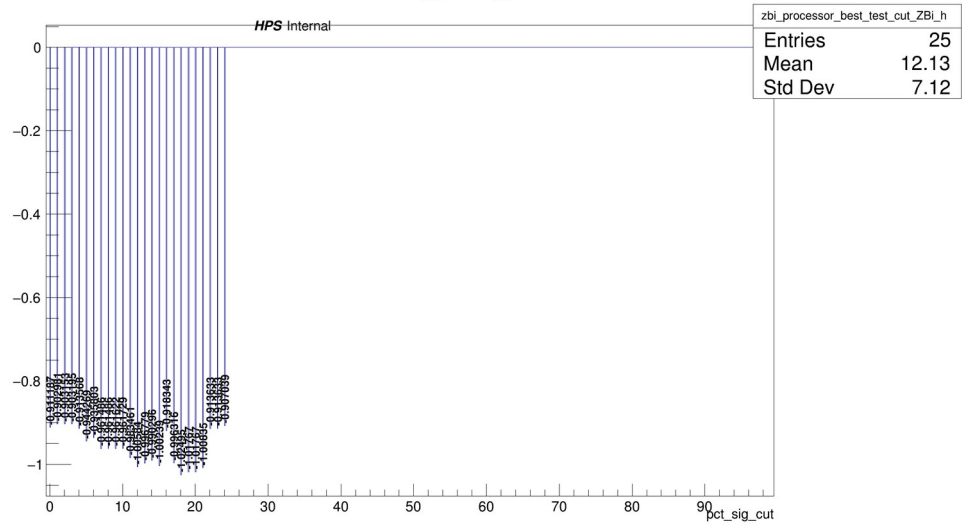
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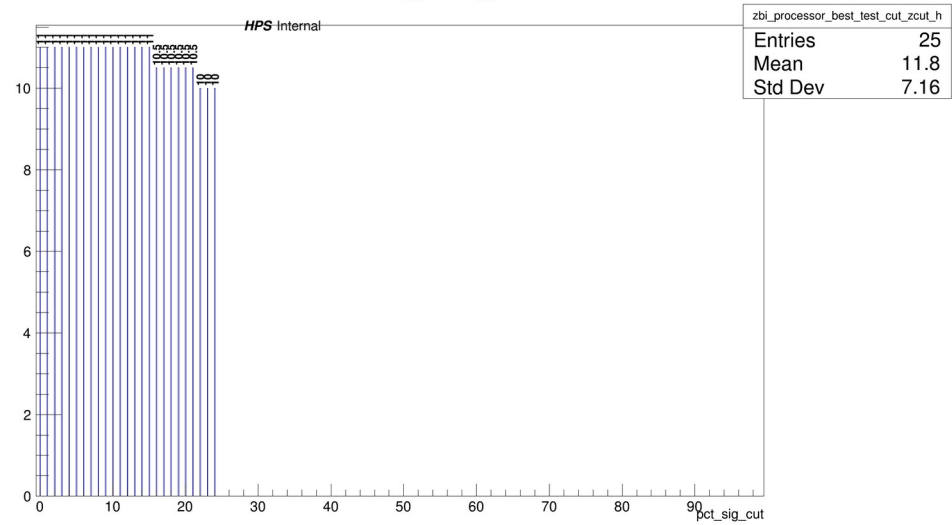
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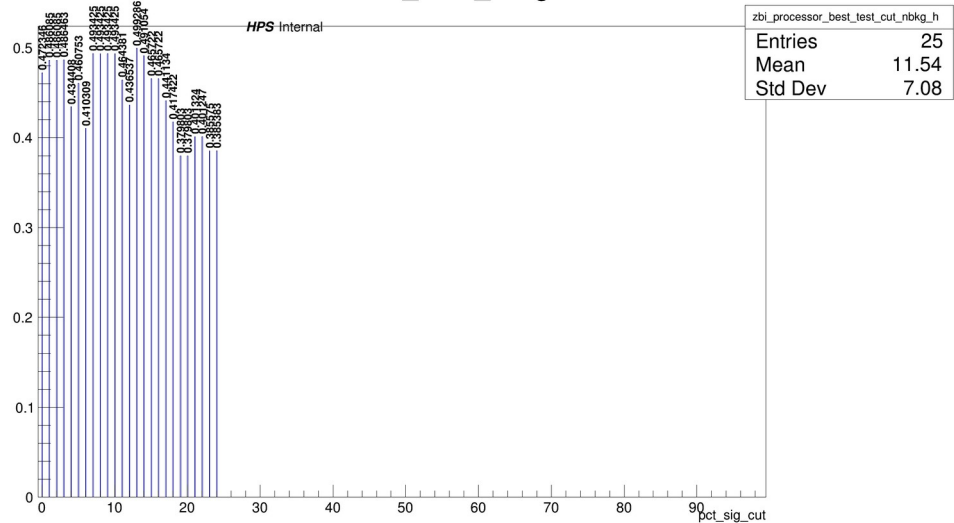


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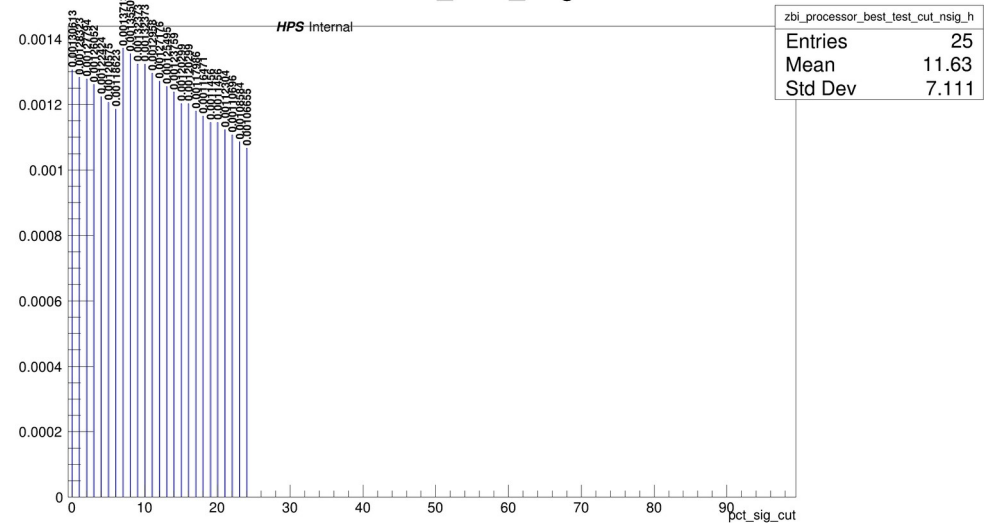




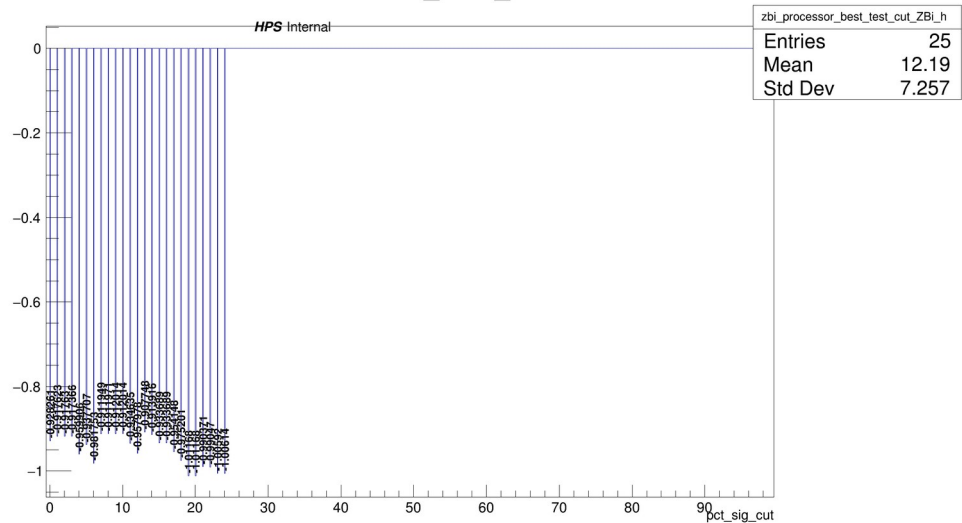
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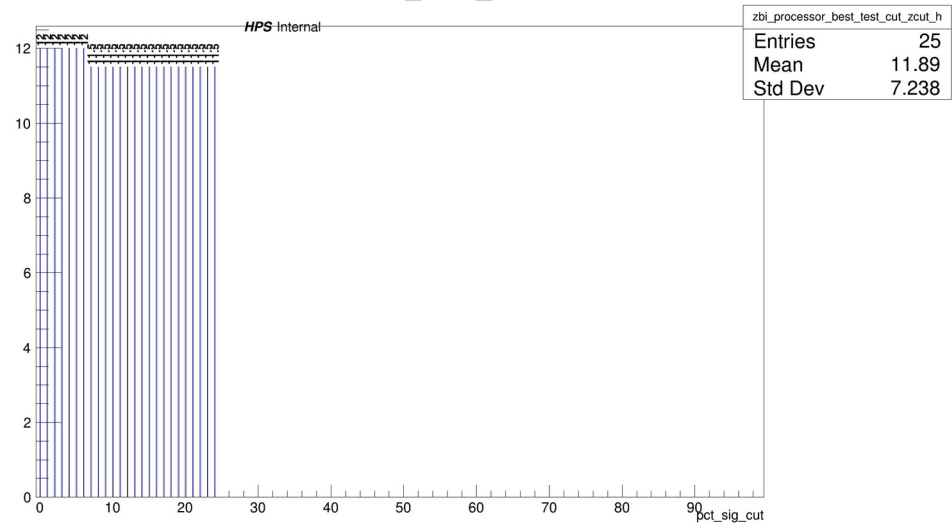
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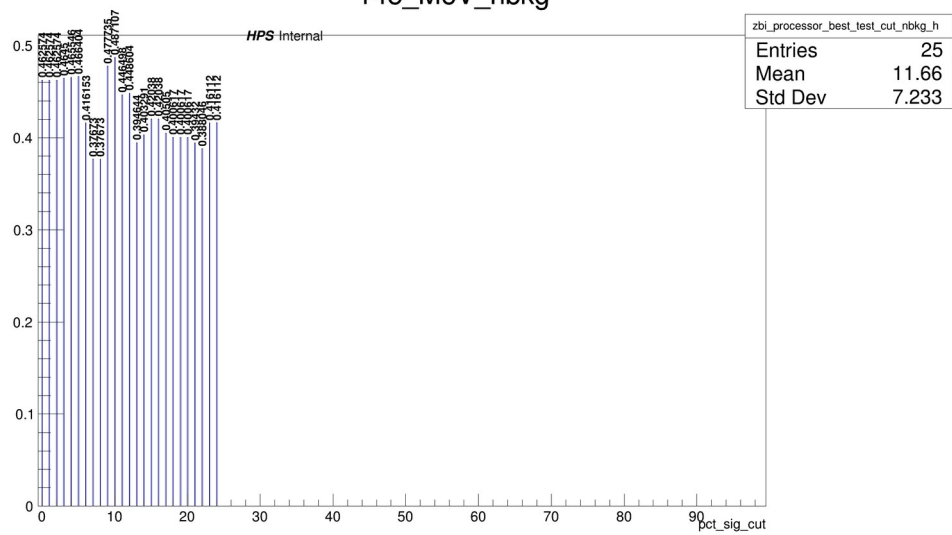
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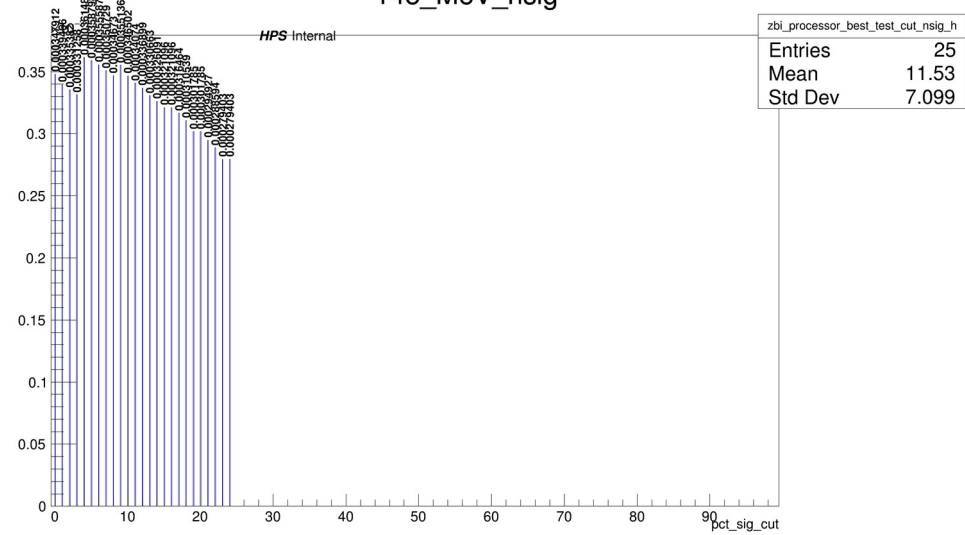
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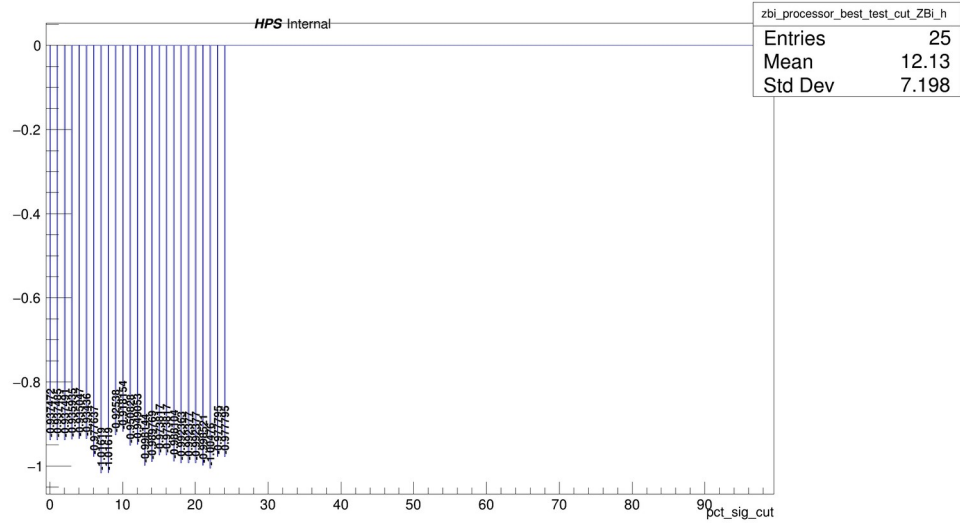
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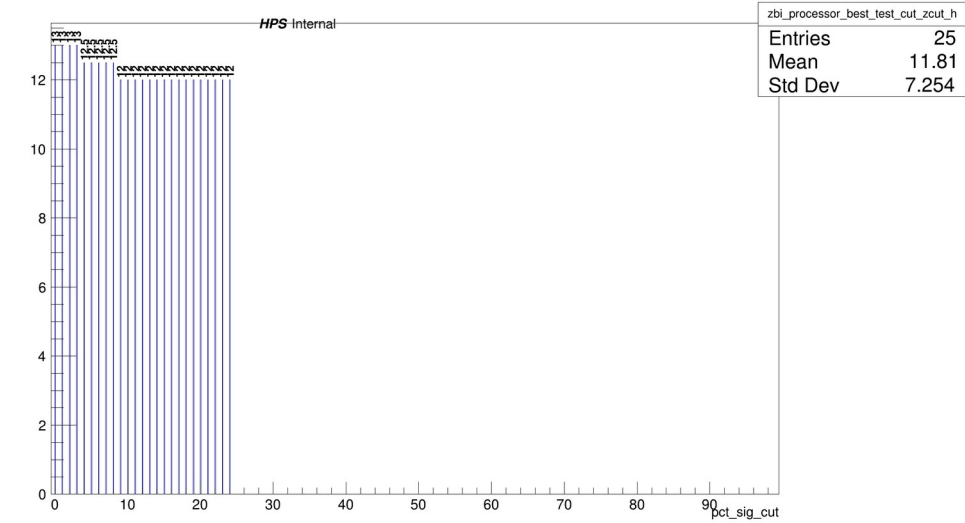
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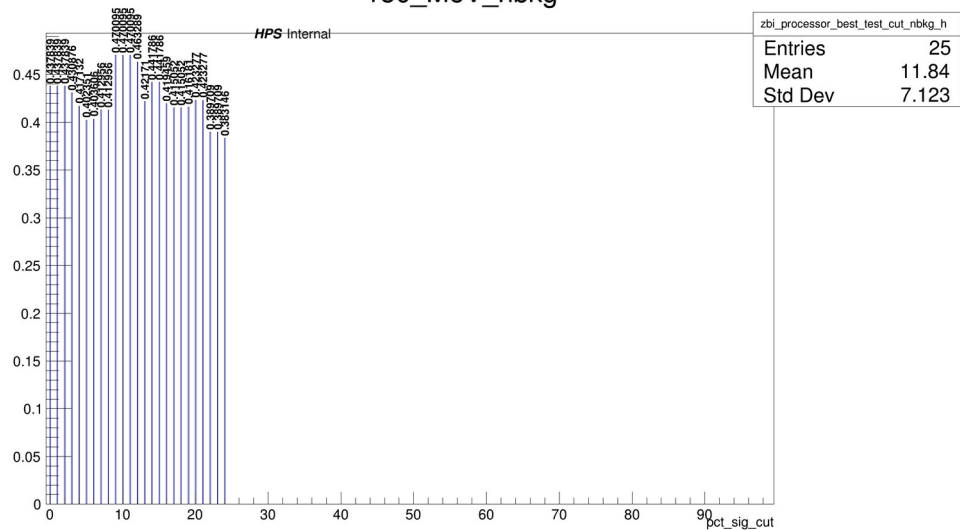
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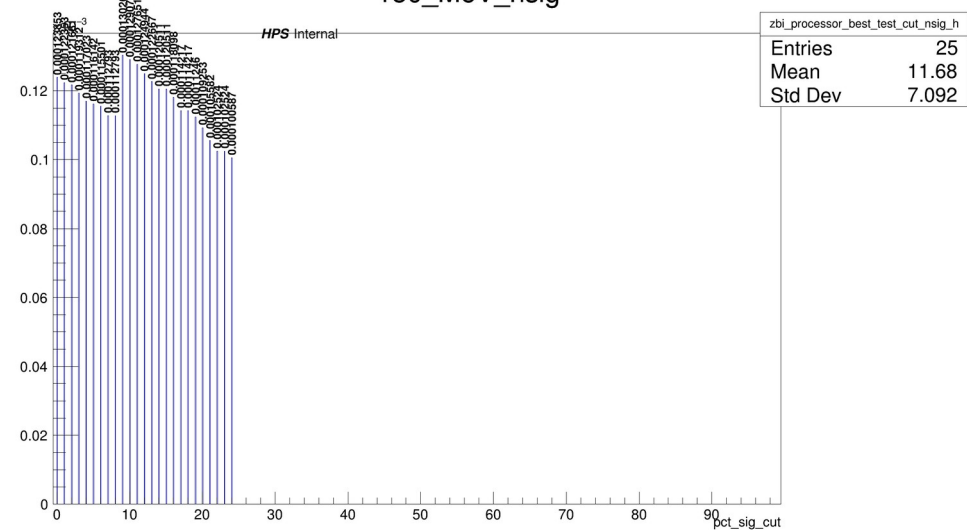
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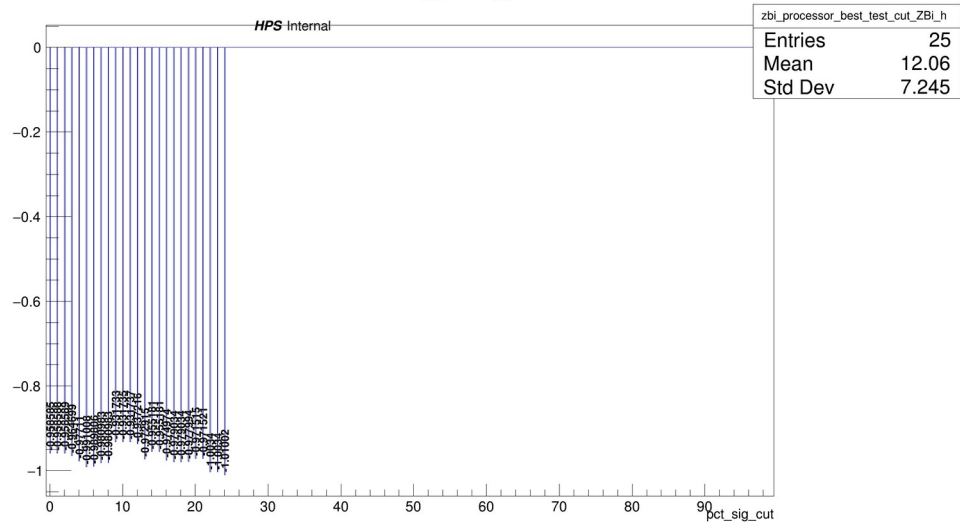
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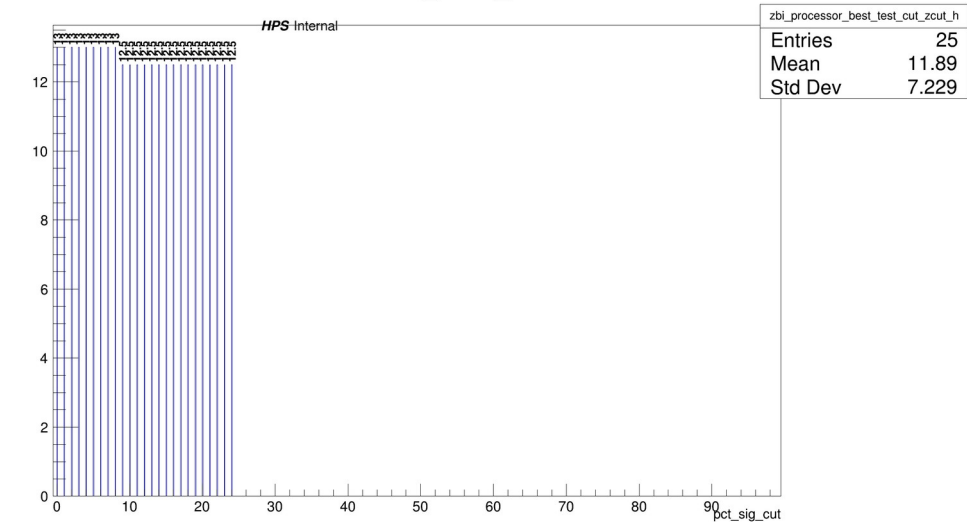
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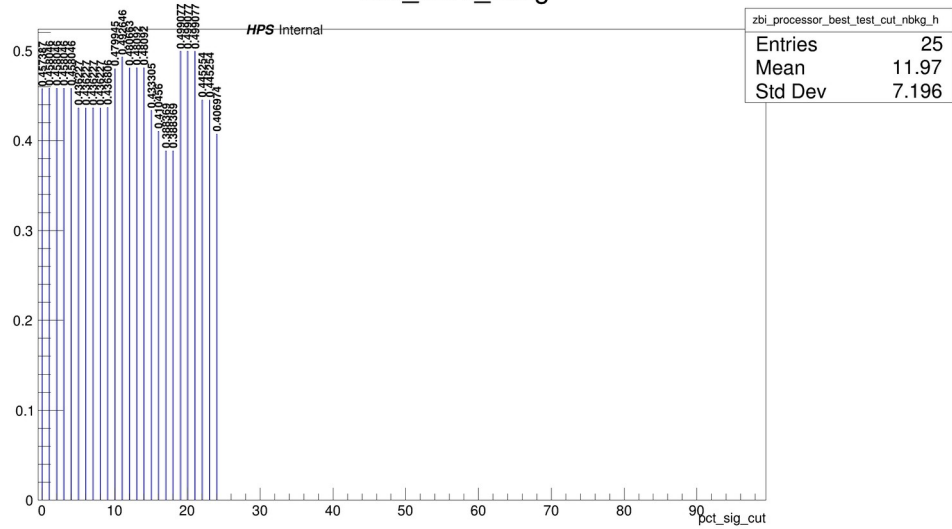
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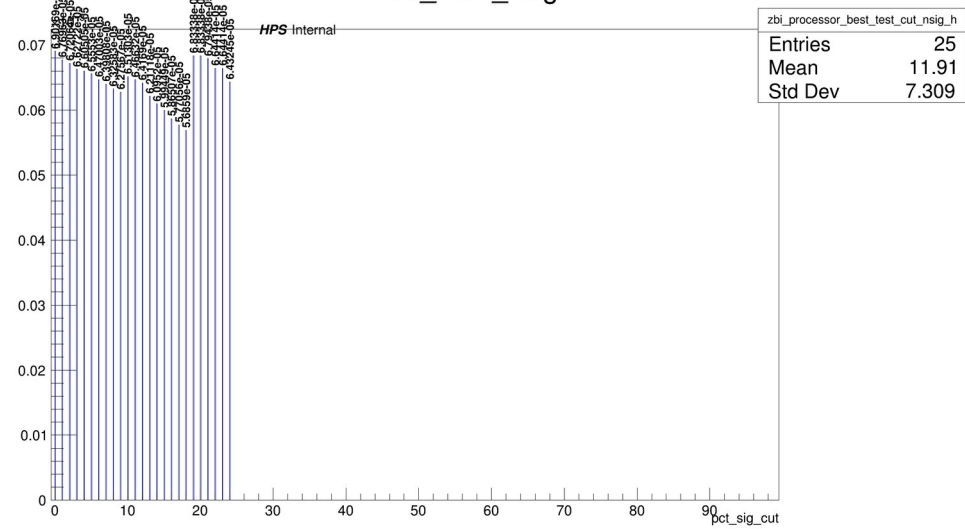
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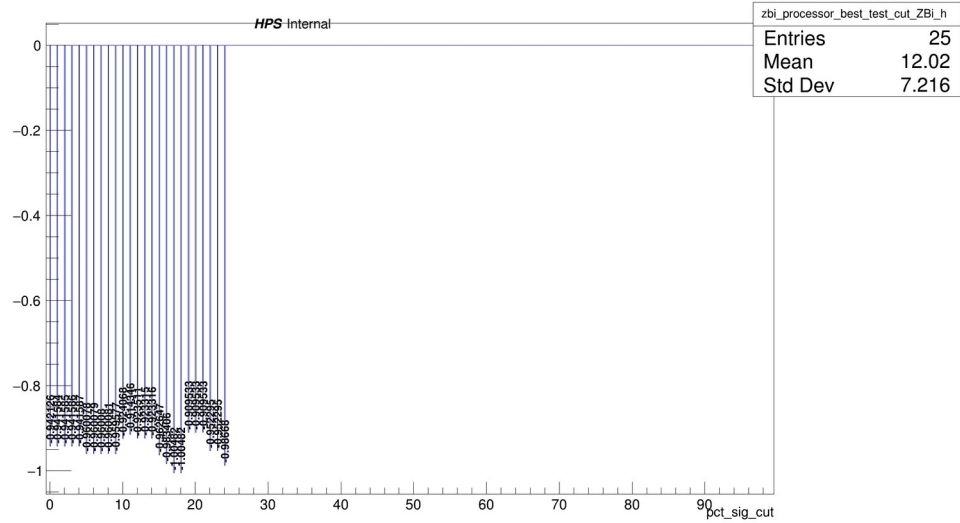
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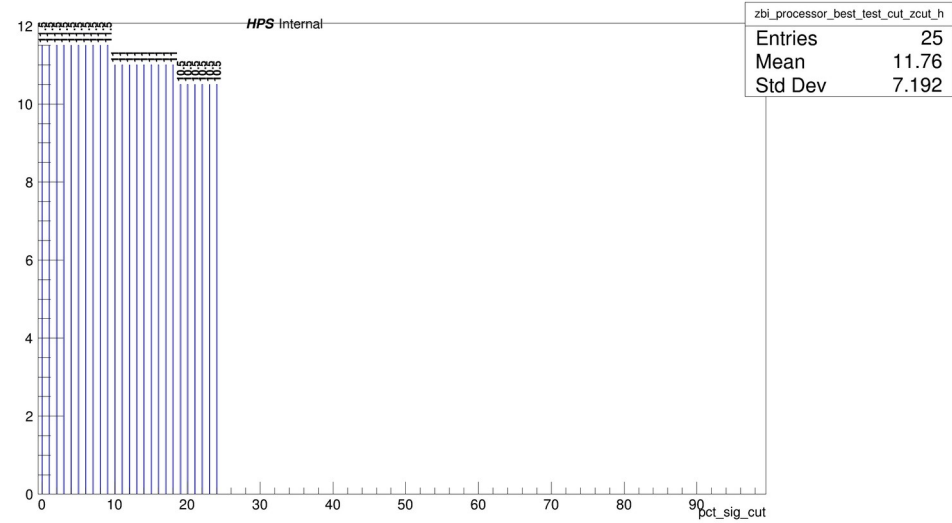
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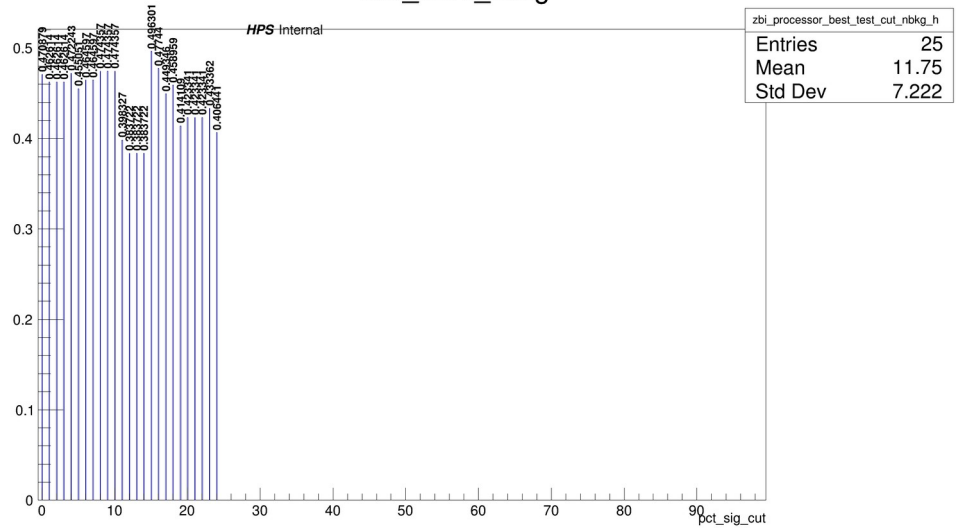
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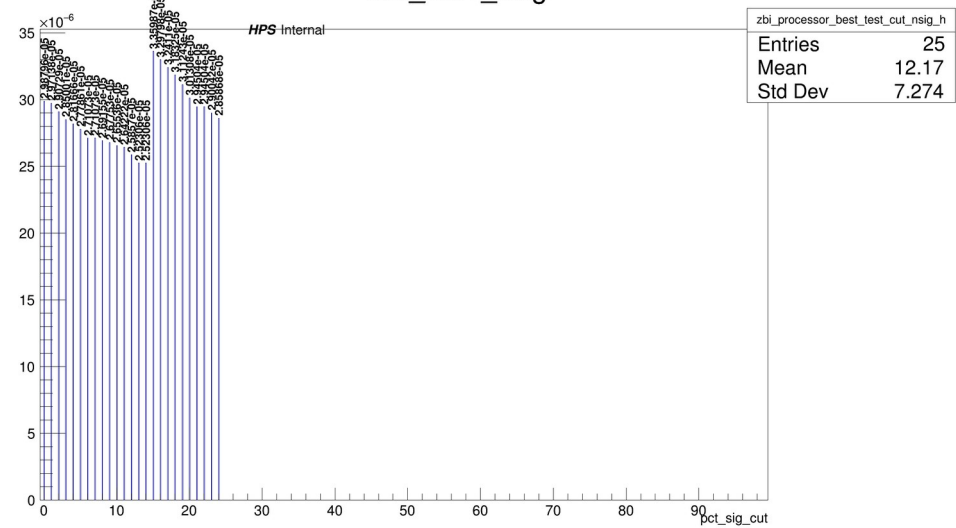
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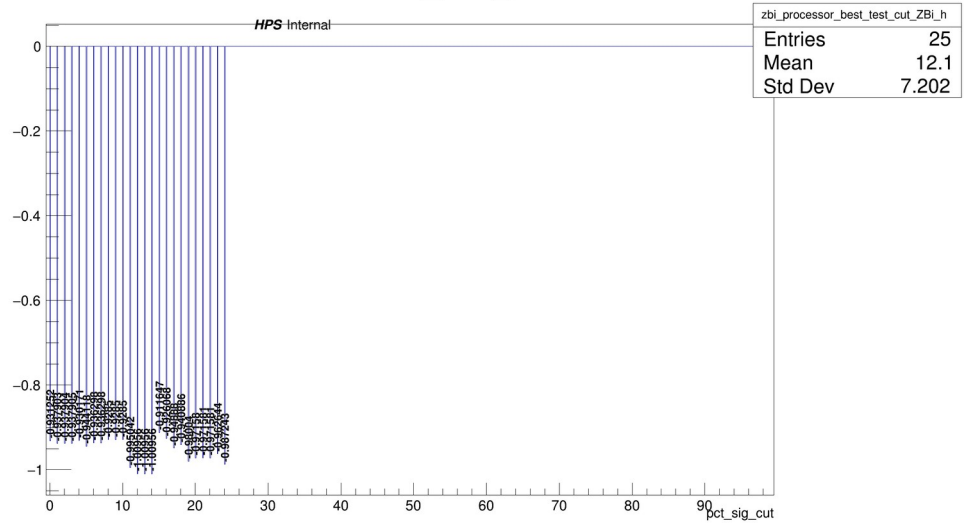
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160\_MeV\_zcut

