

# Offline Electron Seeding Validation - Update

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# INTRODUCTION

- ▶ Our goal is to study **seeding** for the **offline** Gsf tracking with the **new pixel detector**.
- ▶ Previous talk<sup>1</sup> gave introduction/motivation to approach
- ▶ Since Then,
  - ▶ Migrated Code from 8\_1\_0 to 9\_0\_2
  - ▶ Regenerated trackingNtuples for dataset

`/DYJetsToLL_M-50_TuneCUETP8M1_13TeV-madgraphMLM-pythia8`  
`/PhaseISpring17DR-FlatPU28to62HcalNZS_90X_upgrade2017_realistic_v20-v1/GEN-SIM-RAW`

- ▶ Calculated  $\Delta\phi_{1,2}/\Delta z_{1,2}$  for distances between extrapolated SC and reconstructed pixel hit
- ▶ Added additional detector information (Ladder/Blade) for matched hits

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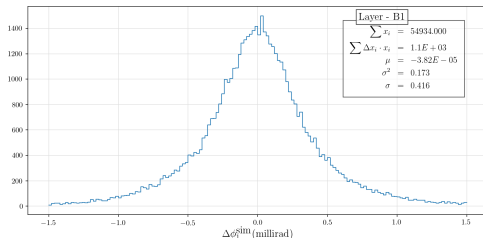
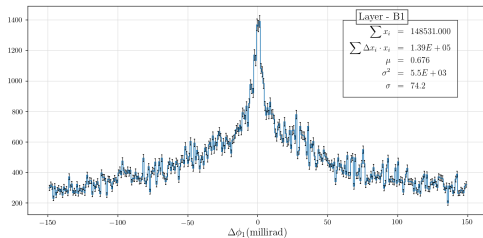
<sup>1</sup><https://indico.cern.ch/event/616443/contributions/2669480/attachments/1496854/2329372/main.pdf>

## SOME DEFINITIONS

- ▶  $\Delta\phi/z_1$  - Distance between RecHit and extrapolated impact position for first matched hit
- ▶  $\Delta\phi/z_2$  - Distance between RecHit and extrapolated impact position for second matched hit
- ▶  $\Delta\phi/z_1^{\text{sim}}$  - Distance between RecHit and SimHit for 1st innermost hit in Seed.
- ▶  $\Delta\phi/z_2^{\text{sim}}$  - Distance between RecHit and SimHit for 2nd innermost hit in Seed.

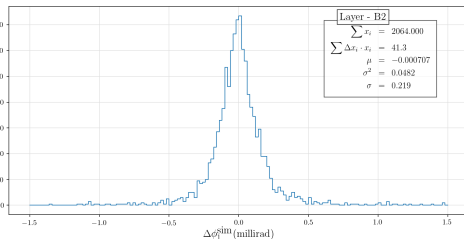
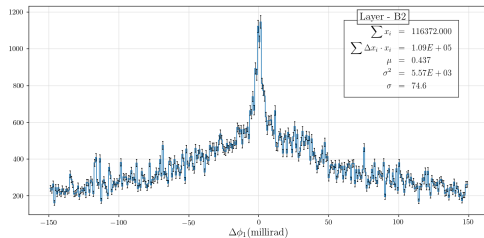
# COMPARING $\Delta\phi_1$ AND $\Delta\phi_1^{\text{SIM}}$ RESOLUTION

- ▶  $\sigma_{\Delta\phi_1} / \sigma_{\Delta\phi_1^{\text{sim}}} \approx 175$
- ▶ But these are measuring quite different quantities!
- ▶  $\Delta\phi_1^{\text{sim}}$  is effectively just the single-hit pixel resolution
- ▶ While  $\Delta\phi_1$  is affected by SC position/energy resolution and beam spot.
- ▶ So not really an apples-to-apples comparison.



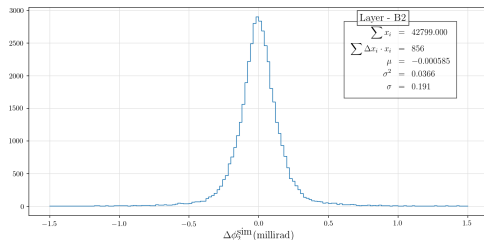
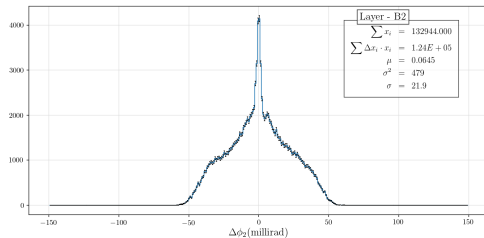
## HITS IN BPIX LAYERS 1 AND 2

- ▶ Same as previous slide, but with Hits in BPIX L2 instead of L1.
- ▶ Note that  $\sigma_{\Delta\phi_1}$  is almost unchanged from the L1 value (74.2 millirad)
- ▶ However,  $\sigma_{\Delta\phi_1^{\text{sim}}}$  decreases by  $\approx 1/r$
- ▶ This is because single-hit resolution is independent of layer.



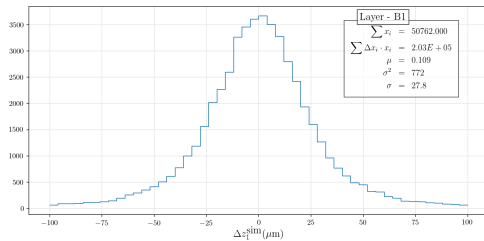
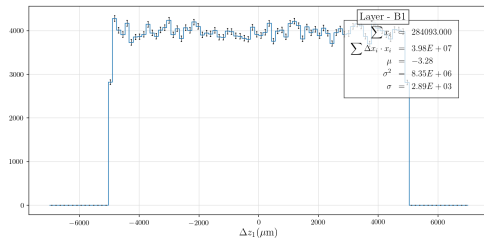
# WHAT ABOUT 2ND BREAKFAST HITS?

- ▶  $\sigma_{\Delta\phi_2^{\text{sim}}}$  is slightly smaller than  $\sigma_{\Delta\phi_1^{\text{sim}}}$
- ▶  $\sigma_{\Delta\phi_2}$  is about 3.4 times smaller than  $\sigma_{\Delta\phi_1}$ , but the width of the core is about the same.
- ▶ Interesting side-band feature. Do experts recognize this?



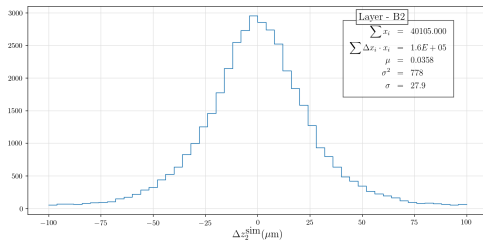
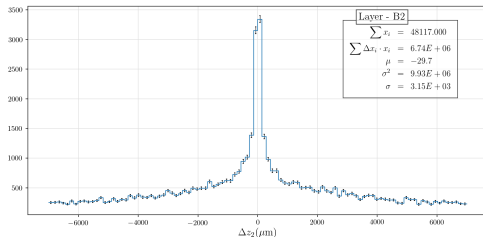
## WHAT ABOUT $\Delta z$ ?

- ▶ The distribution of  $\Delta z_1$  is essentially flat within the window ( $\pm 0.5$  cm).
- ▶ TODO: comment regarding why distribution is flat



## AND FINALLY, WHAT ABOUT $\Delta z$ FOR SECOND HITS?

- ▶ TODO: Remark about current window size ( $\pm 900\mu\text{m}$ )
- ▶ TODO: Remark about  $\Delta z_2^{\text{sim}}$  resolution vs  $\Delta z_1^{\text{sim}}$ .





## OUTLOOK

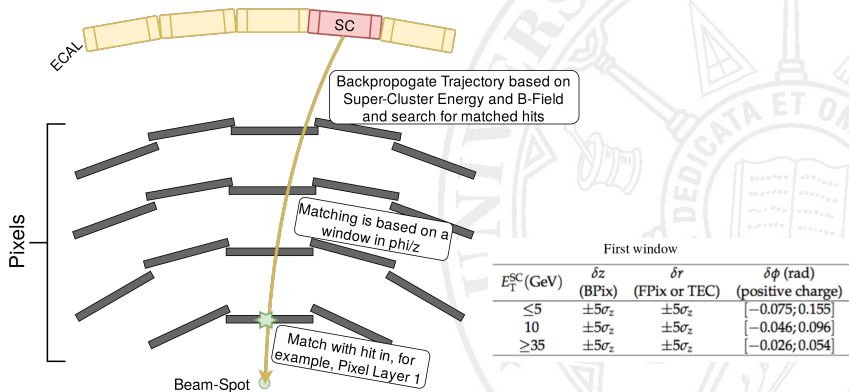
- ▶ TODO: Plans that demonstrate VISION!
- ▶ Suggestions from experts?



BACKUP



# GSF ELECTRON SEEDING I



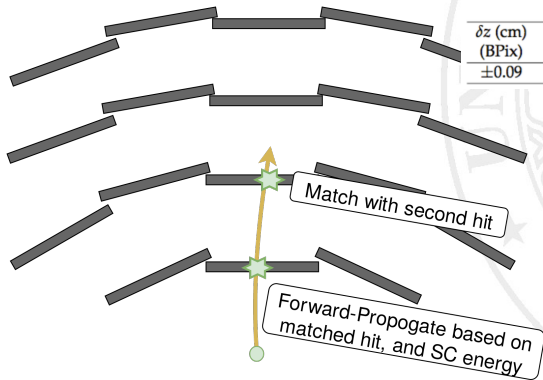
Windows from <https://indico.cern.ch/event/611042/contributions/2464057/attachments/1406271/2148742/ElectronTracking30112016.pdf>

## GSF ELECTRON SEEDING II



Second window

$\delta z$ (cm)	$\delta r$ (cm)	$\delta r$ (cm)	$\delta\phi$ (rad)	$\delta\phi$ (rad)
(BPix)	(FPix)	(TEC)	(BPix)	(FPix or TEC)
$\pm 0.09$	$\pm 0.15$	$\pm 0.2$	$\pm 0.004$	$\pm 0.006$



## Gsf Electron Seeding III

