

Tests on Determining Hit Locations from Source Pulses

Direct method

Some preliminary tests

The plan for the next step

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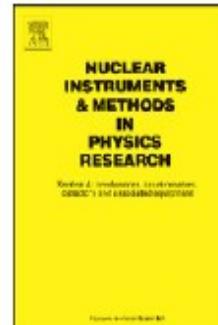
05/10/2016



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Determination of the hit locations in segmented HPGe detectors without the use of simulations or scanning systems

P. Désesquelles *

NIMA 654 (2011) 324-329

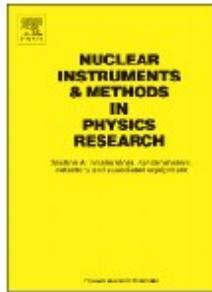
- # Signals from simulation codes: MGS and AGATAGeFEM
- # Obtained the correlations between the variables and the estimated values
- # Obtained the position errors (depends on code and grid size)



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Direct determination of the hit locations from experimental HPGe pulses



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NIMA 729 (2013) 198-206

Data from Liverpool scanning system

Obtained the correlations between the variables and the estimated values

Obtained the position errors, good enough for tracking

Can build a set of basis

Total number of hits is a little less than the optimum value

Direct Method

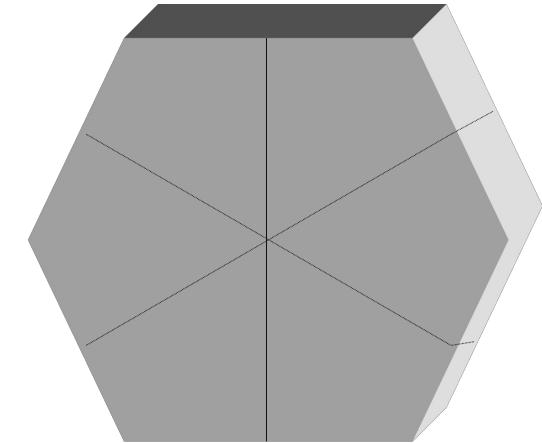
Calculate the hit distribution for all the segments with simulation

Calculate some variables from exp signals
(raw estimator)

Get the correlation between raw estimators and the coordinates from the distributions

Estimate the coordinates from exp traces Based on the correlation

Direct method will be able to determine the coordinates of hit position of gamma interactions in a HPGe detector from the experimental signals without requiring the basis from simulation or scanning device.



Raw Estimators

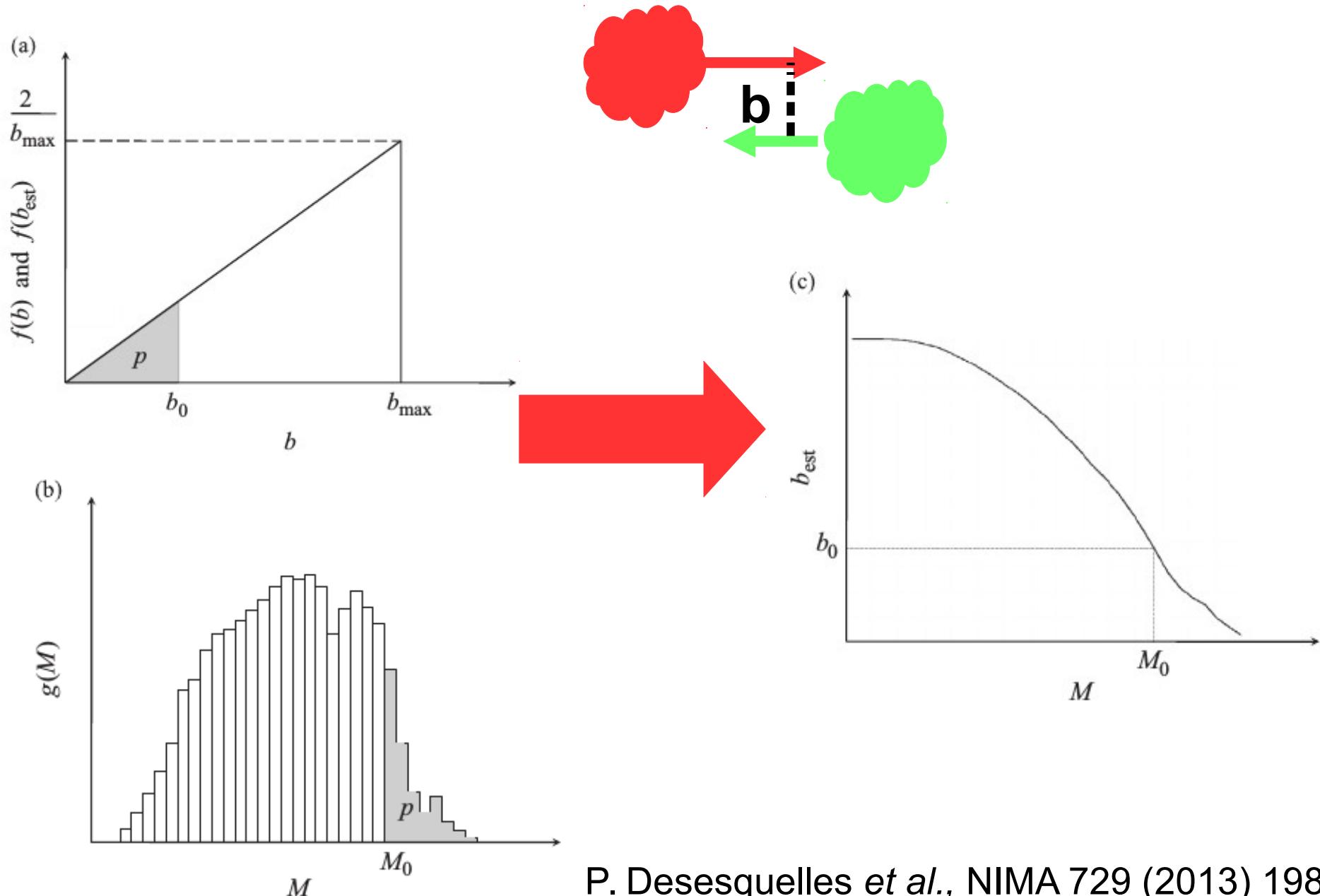
$r = \sum (i - \langle i \rangle)^3 * s_i / \sum (s_i)$ from net signal (r estimator)

$s_i = (S_{i+1} - S_{i-1})/2; \langle i \rangle = \sum (i * s_i) / \sum (s_i)$

$\phi_i = (S_i^2 - S_r^2) / (S_i^2 + S_r^2)$ from net signal's neighboring transient signals in the same ring (phi estimator)

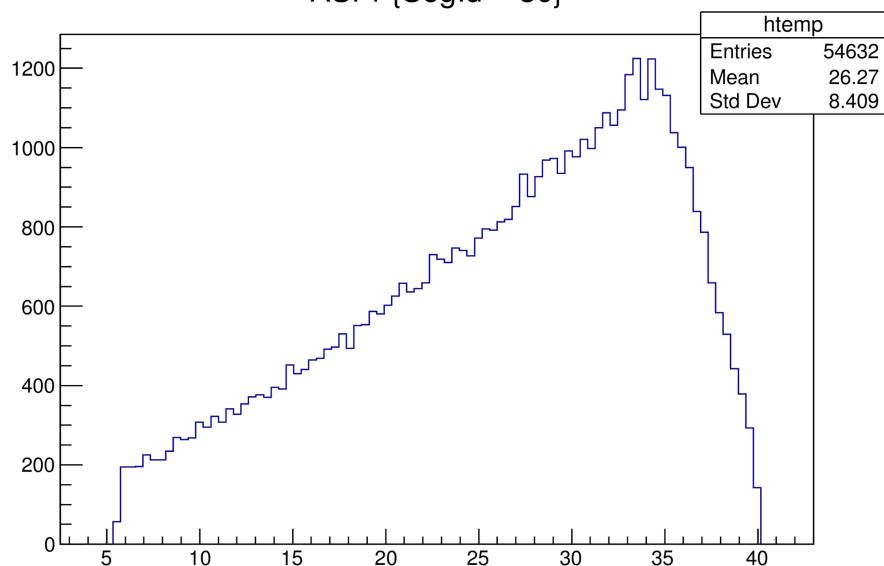
$zed = (S_t^2 - S_b^2) / (S_t^2 + S_b^2)$ for middle rings (z estimator)

How to Obtain the Correlation?

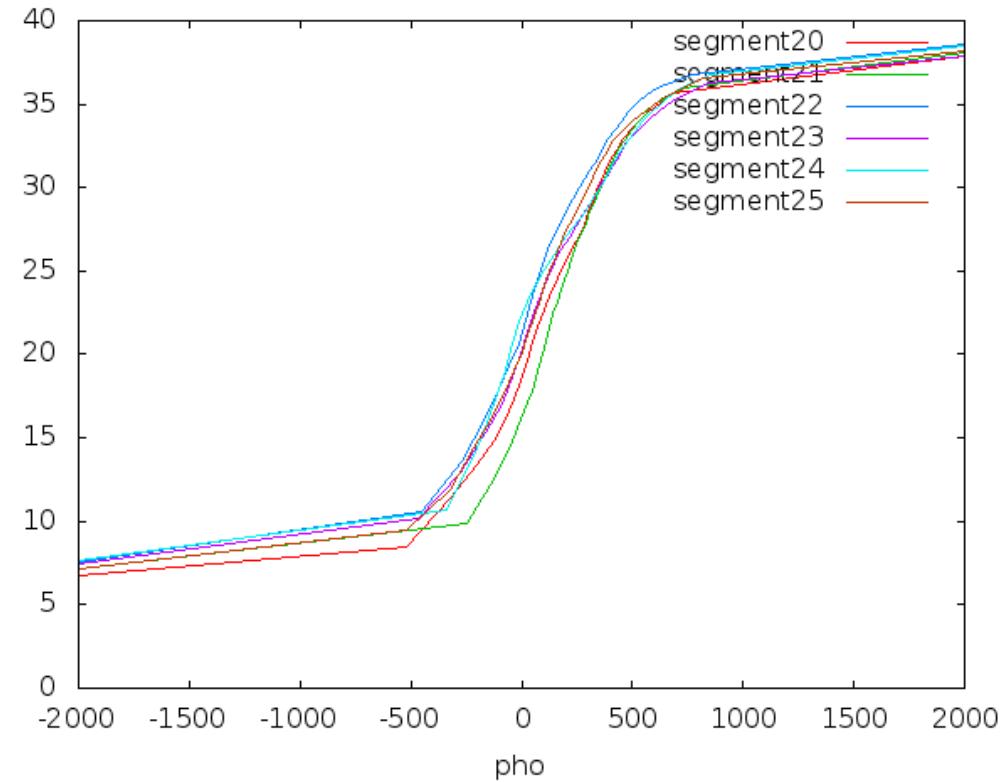
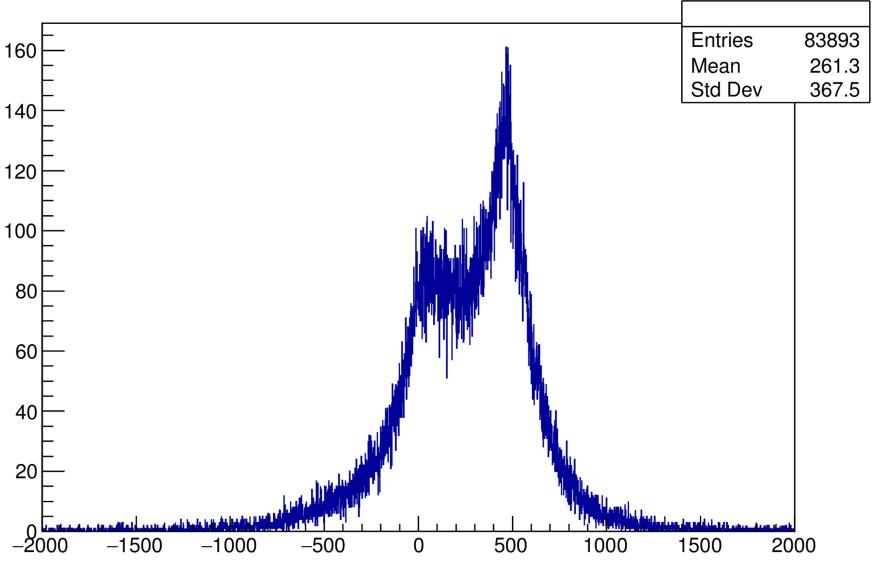


10^8 events of ^{60}Co source

ASPr {SegId==30}

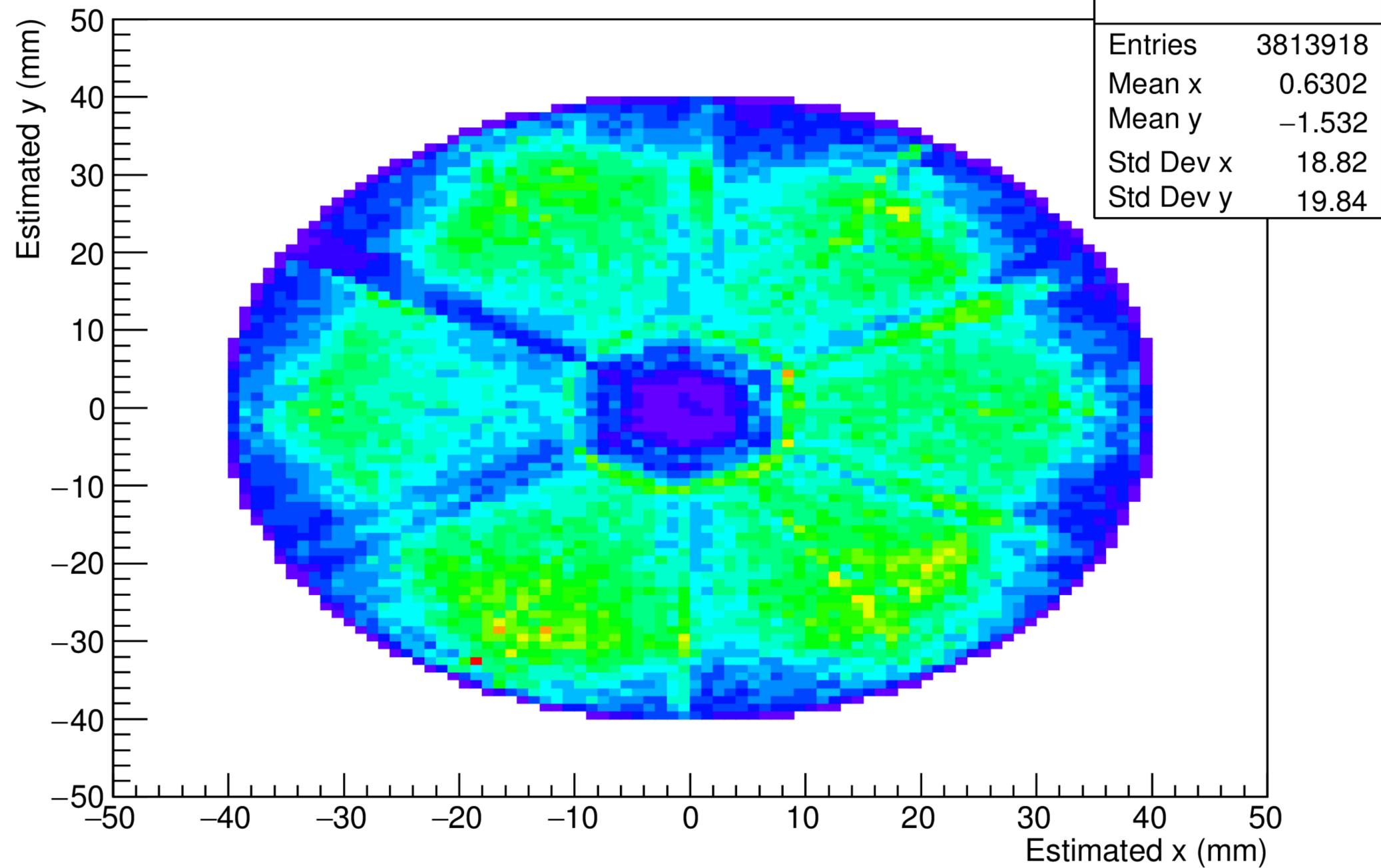


pho1 {SegId==3}

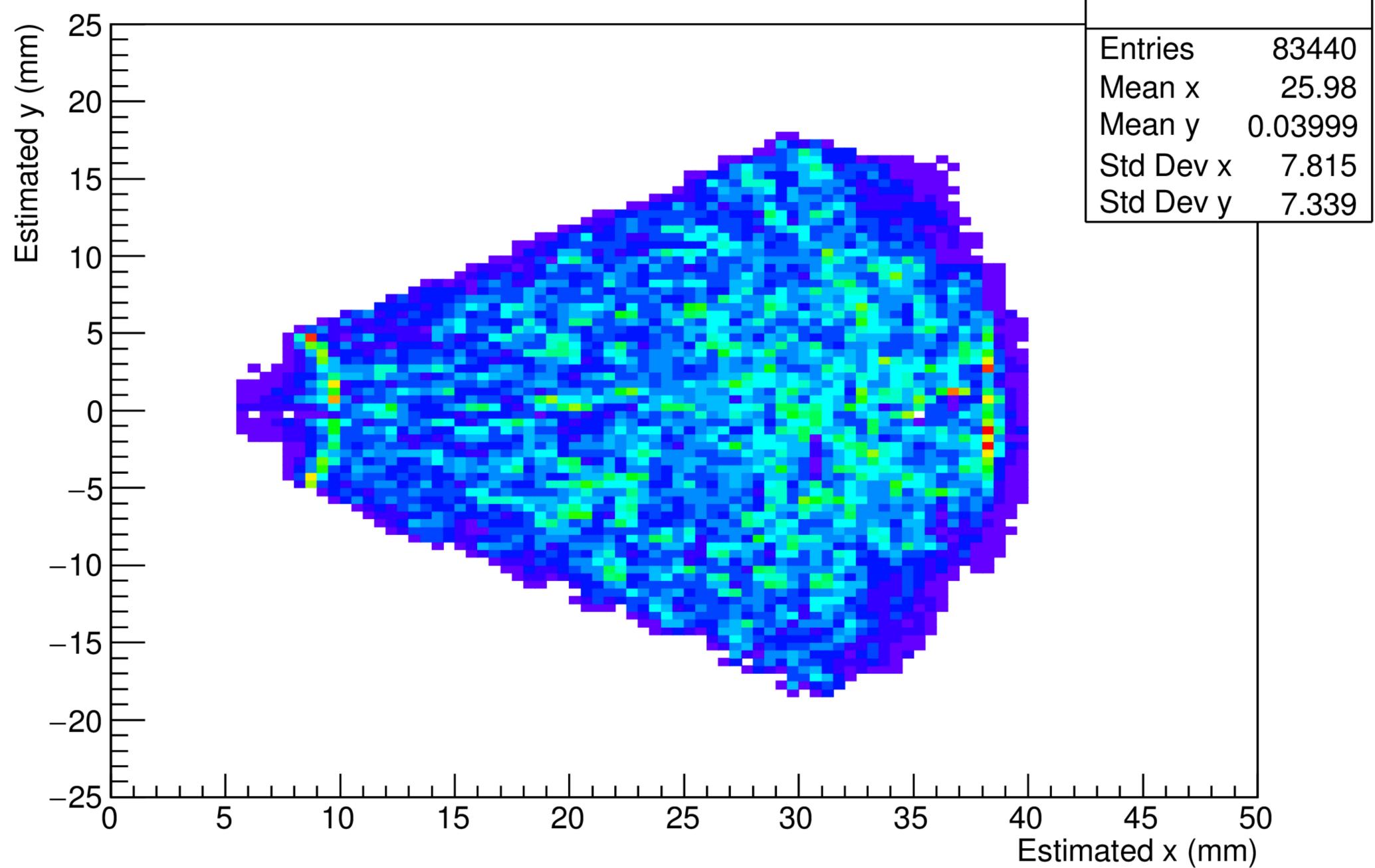


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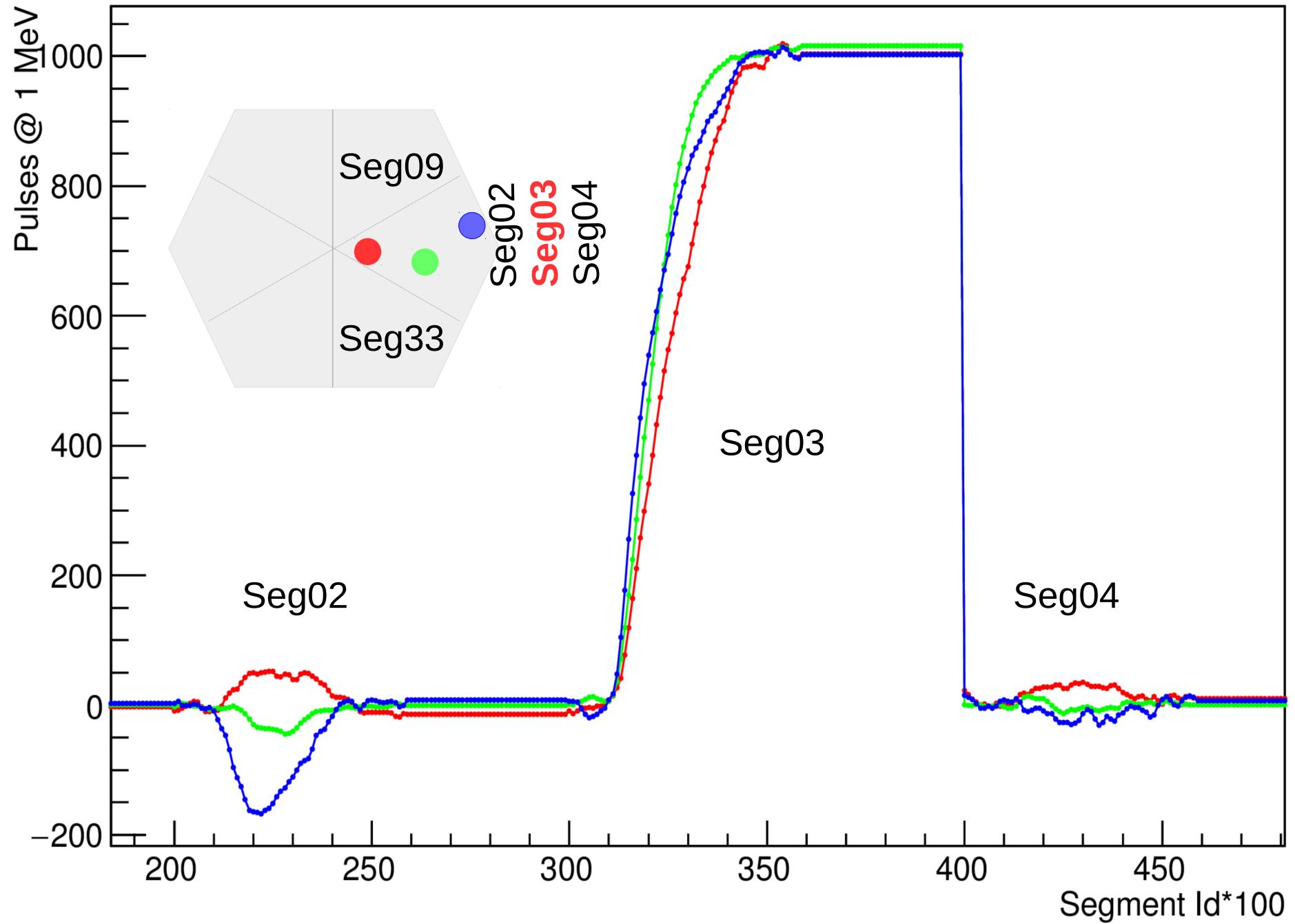
Estimated distribution

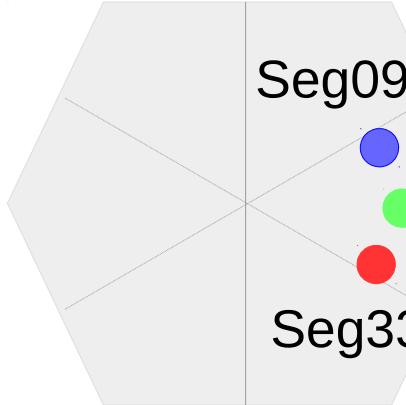


Estimated distribution @ Segment 03



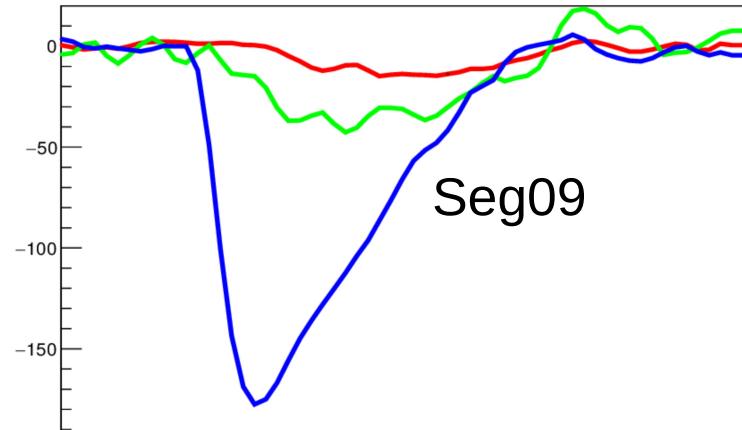
Segment03 Bases @ different r



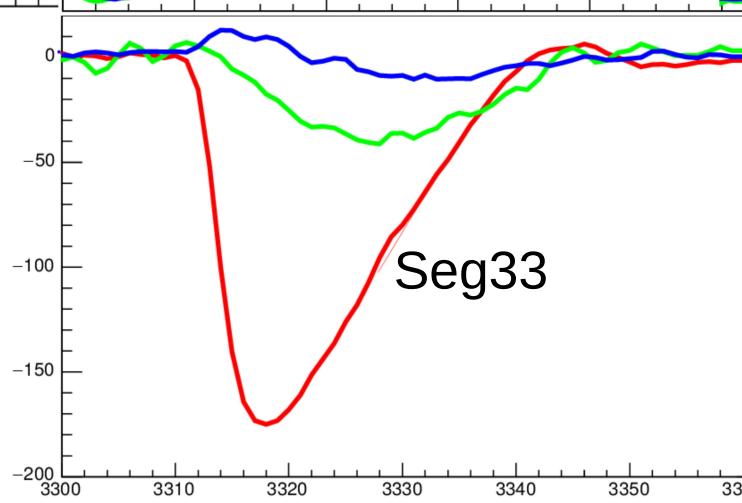
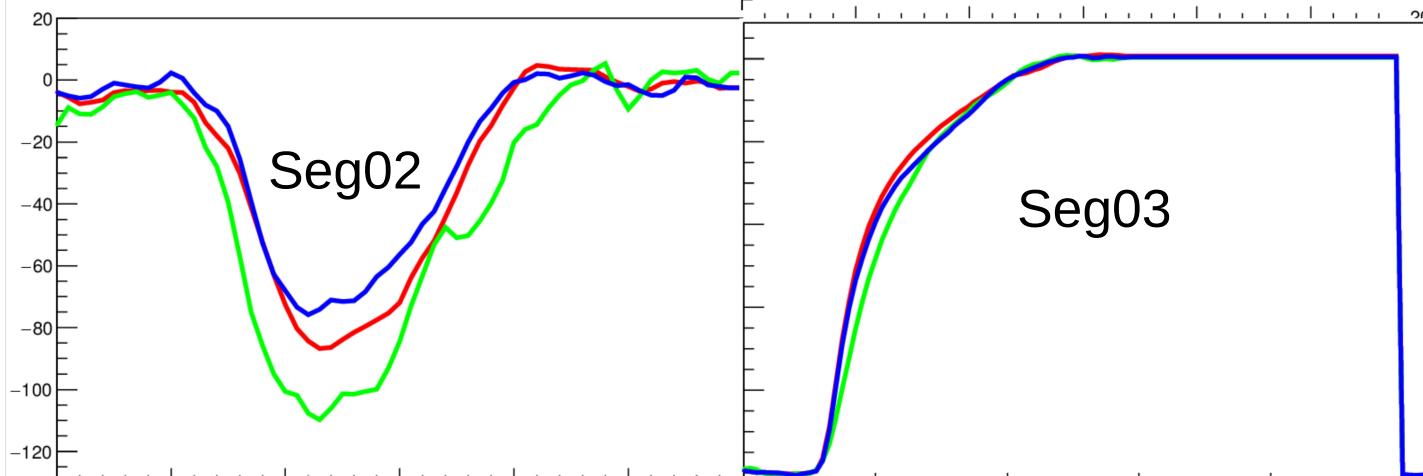


Seg02 **Seg03** **Seg04**

Seg33

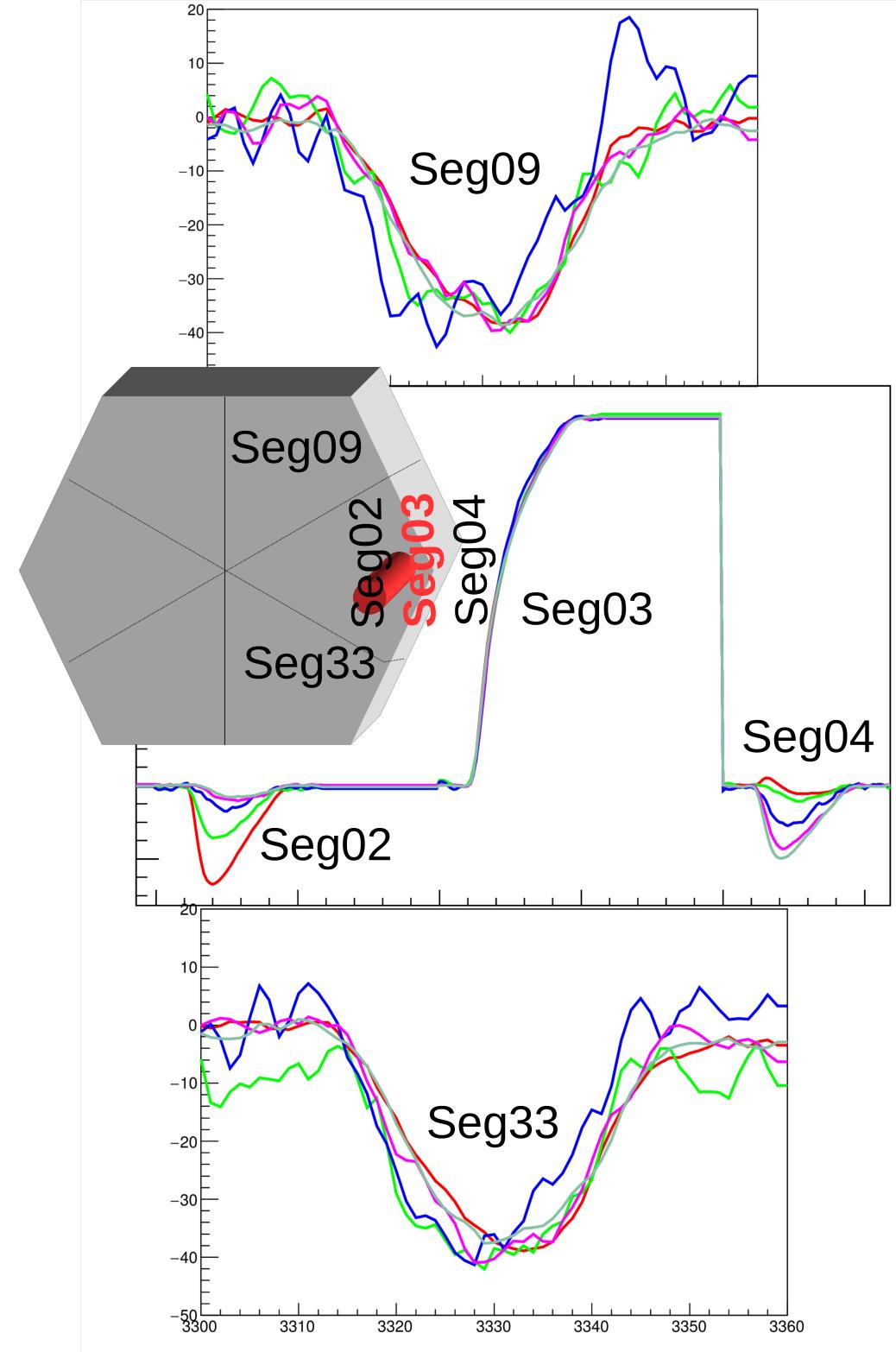
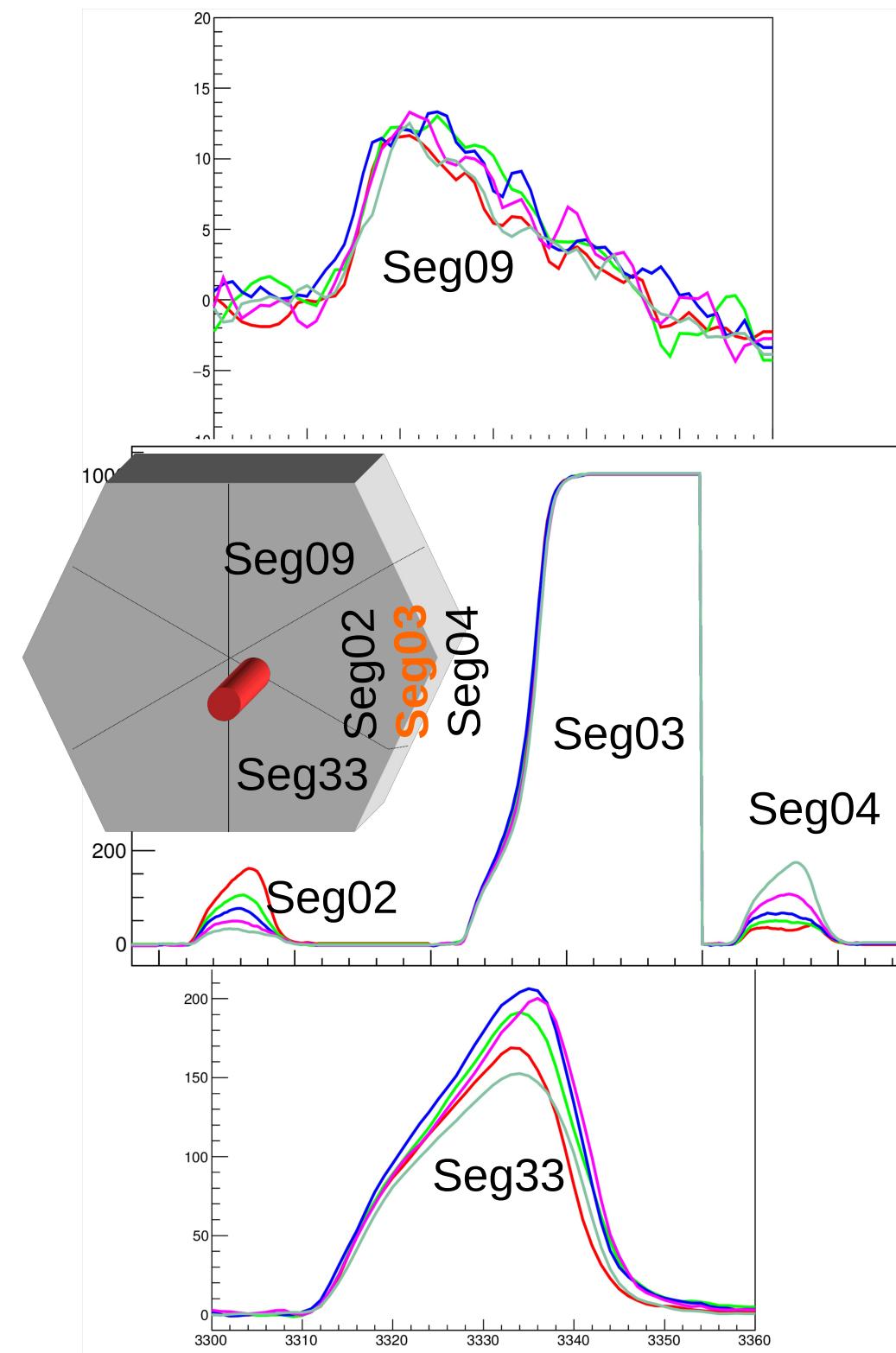


**Same r
different phi
zed free**

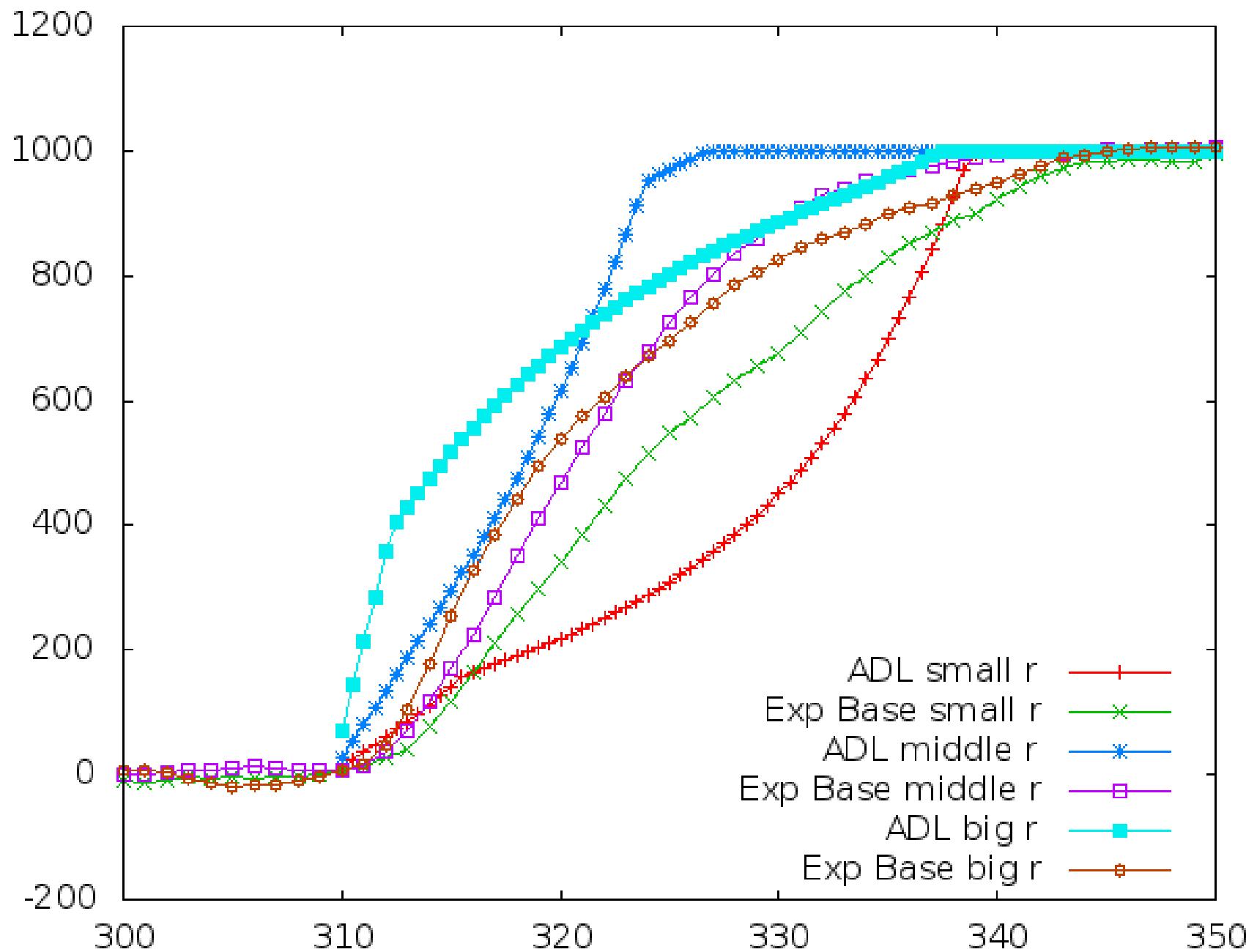


Seg04

Seg04



Source Bases vs ADL



Next Step

Find a way to test whether it works well (e.g.
Doppler Correction)

Optimize the estimators

Deal with multi-hits in one segment

Thank you!