

Improving Pulse Shape Analysis in a tracking array with reference pulses obtained from source data

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Outline

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In-situ Method Applied on Source Data @ GANIL

Flow Chart

Validation the Method with ADL Simulation

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Experimental Basis Applied on e663 In-beam Data

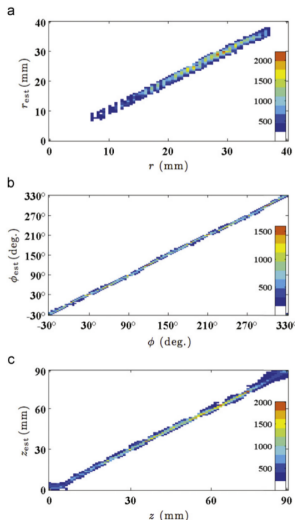
Perspective

In-situ Method for Building Basis

Determination of hit coordinates of gamma interactions directly from the experimental signals without requiring the basis from simulation or scanning device.



In-situ Method Using Calculated Signals



P. Désesquelles, NIMA 654 (2011) 324-329

- Signals from simulation.
- Correlations between the coordinates and the estimators.

- Errors of position.

- $R : \frac{\sum_i (i - \langle i \rangle)^3 s_i}{\sum_i s_i}$

$$\langle i \rangle = \frac{\sum_i i s_i}{\sum_i s_i}$$

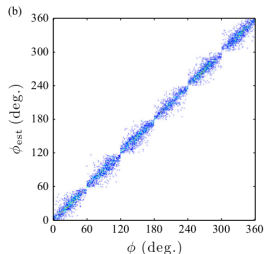
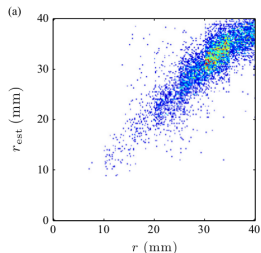
$$s_i = (S_{i+1} - S_{i-1})/2$$

- $\Phi : \frac{\sum_i S_{li}^2 - S_{ri}^2}{\sum_i S_{li}^2 + S_{ri}^2}$

- $Z : \frac{\sum_i S_{ti}^2 - S_{bi}^2}{\sum_i S_{ti}^2 + S_{bi}^2}$



In-situ Method Using Scanned Data



- Signals from Liverpool scanning system.
- Correlations between the coordinates and the estimators.
- Errors of position.



Flow Chart

Monte Carlo Geant4 Simulation

Energy, x , y , z positions and hit segment. $\Rightarrow$ The distribution of hit positions (r , ϕ , z).

^{60}Co Source Measurement

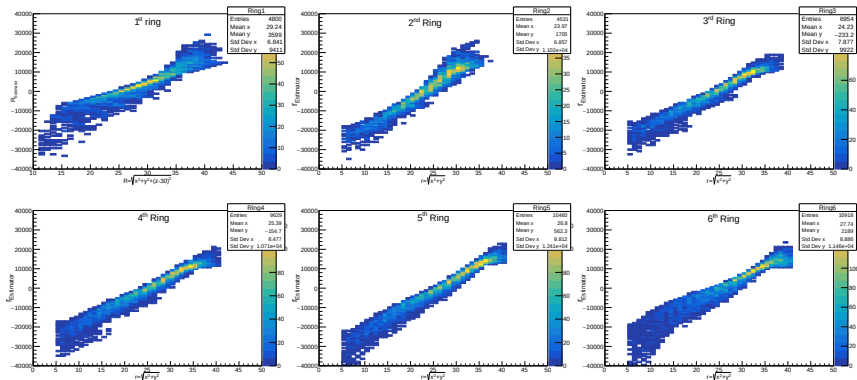
^{60}Co source pulses. $\Rightarrow$ Distribution of raw estimators (a function of pulses related to hit locations).

Coordinates Determination

Hit positions determined by the correlation between raw estimators and hit locations.

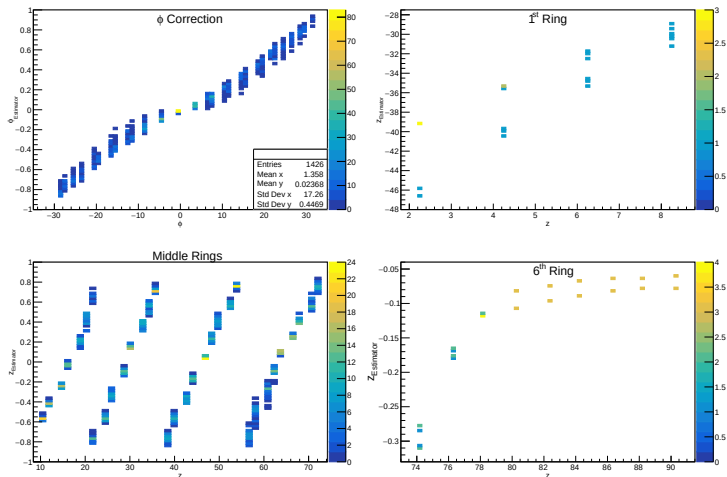


Correlation between the Coordinates and its Raw Estimators

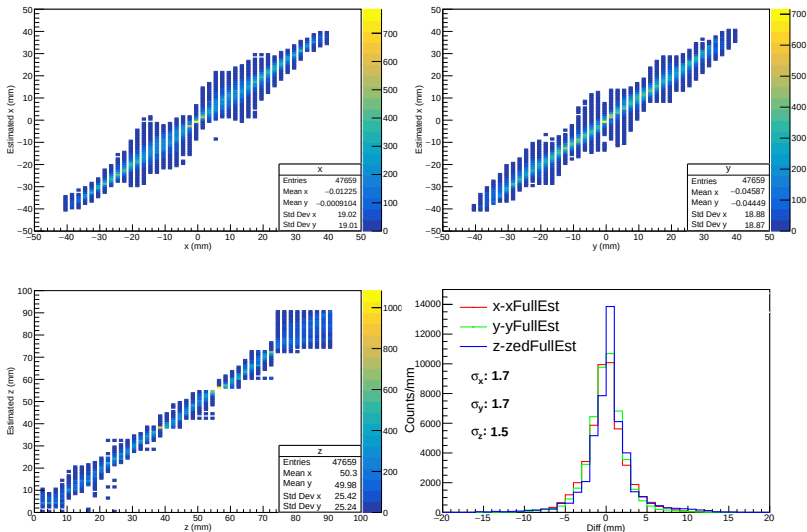




Correlation between the Coordinates and its Raw Estimators

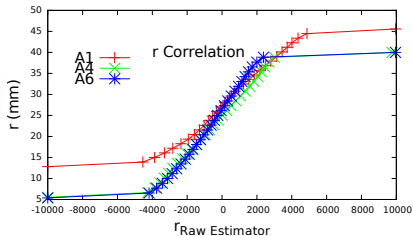
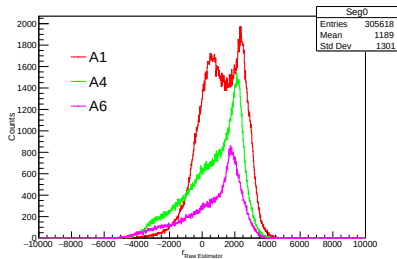
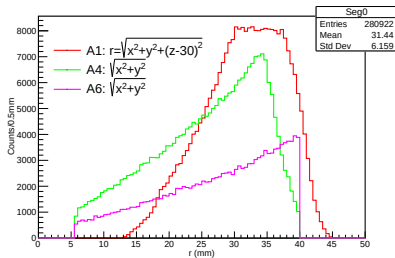


Coordinates Determination from ADL Simulation Data

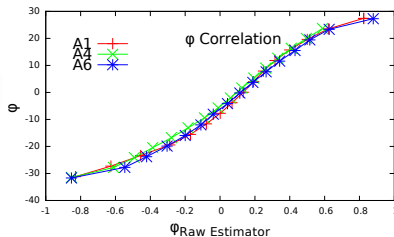
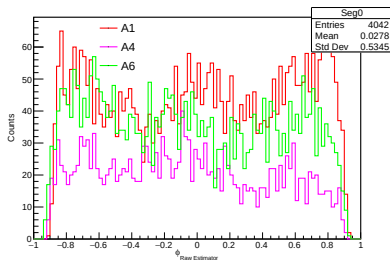
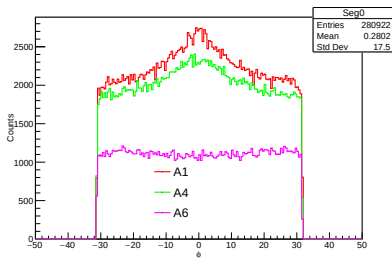




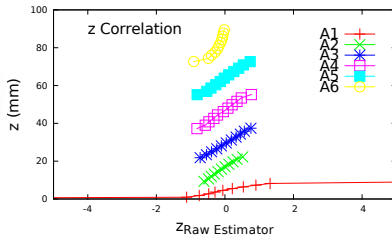
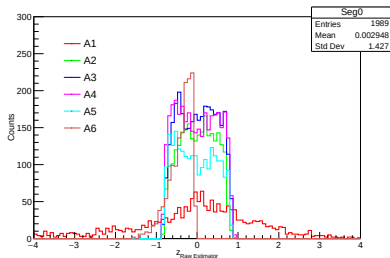
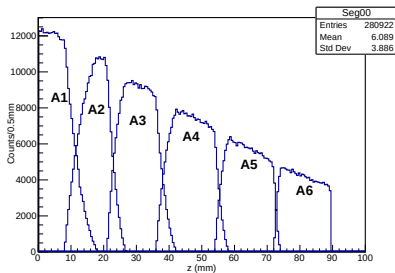
How to Build the Basis?



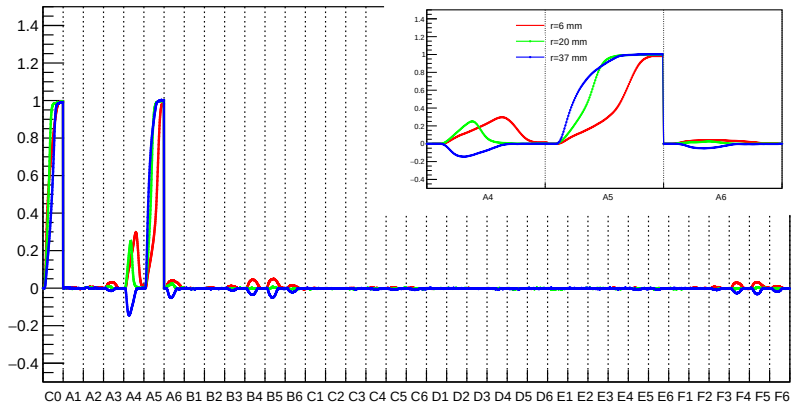
How to Build the Basis?



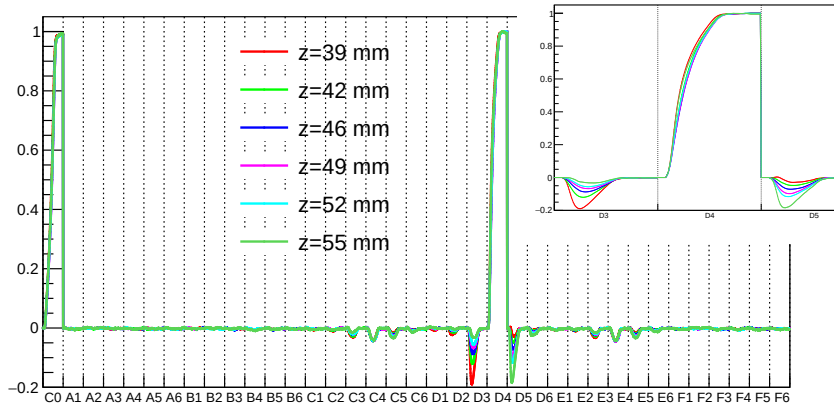
How to Build the Basis?



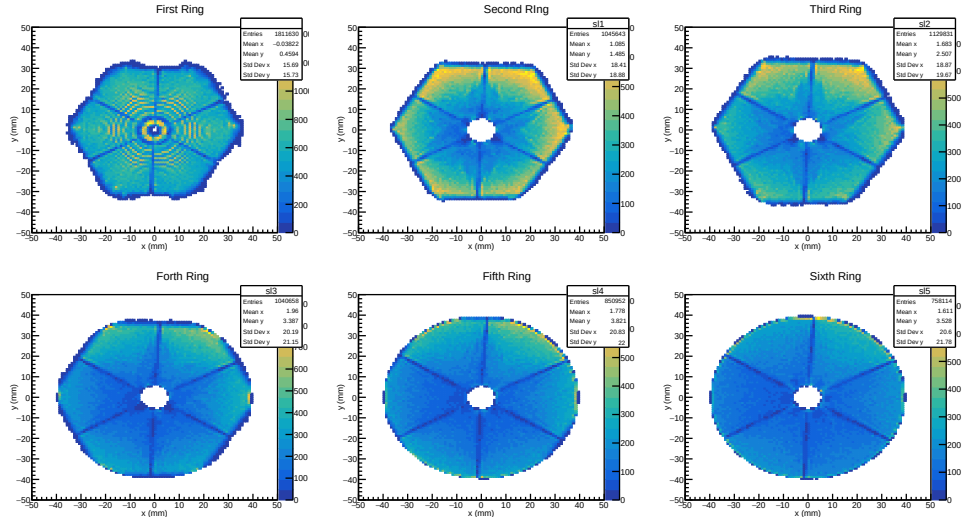
Examples of the Bases



Examples of the Bases

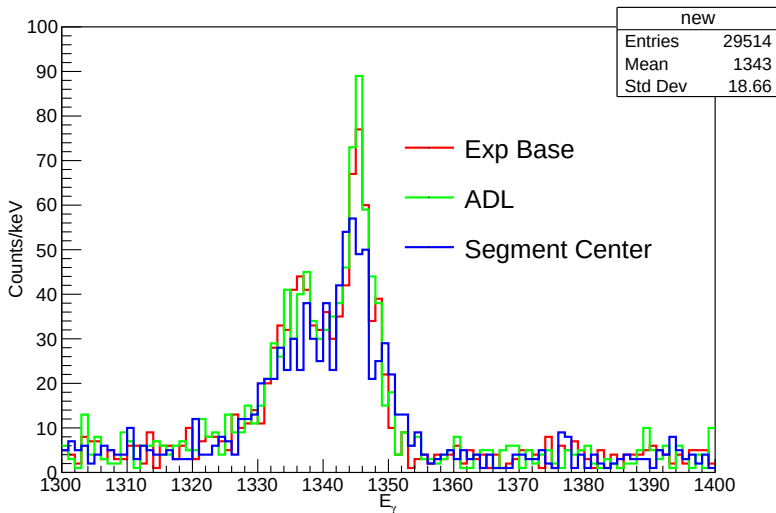


Estimated Distribution from Experimental Traces



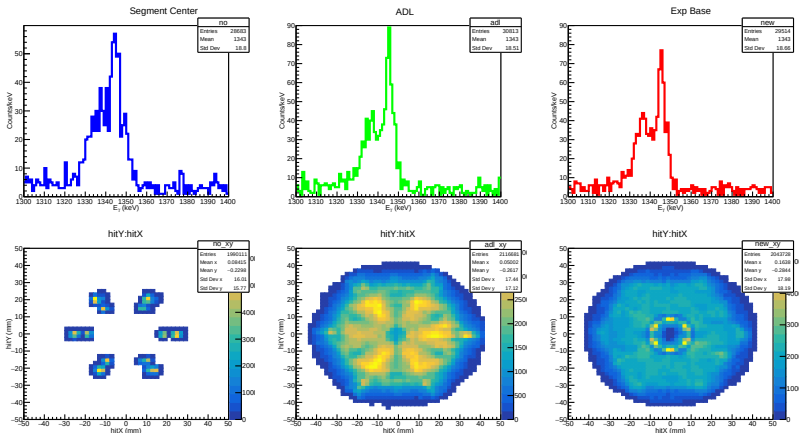


$^{64}\text{Ni } 2^+ @ 1346 \text{ keV}$ from e663 data





$^{64}\text{Ni } 2^+ @ 1346 \text{ keV}$ from e663 data



FWHM: Segment Center9(3), ADL 7.7(1.7) Exp Base 7.5(1.3)

FWHM: Segment Center8(3), ADL 5.2(0.3) Exp Base 5.3(0.3)

Test Doppler Correction Ability with Other In-beam Data

- AGATA @ Compact Position
- Pure γ Spectroscopy Data instead of Lifetime Data

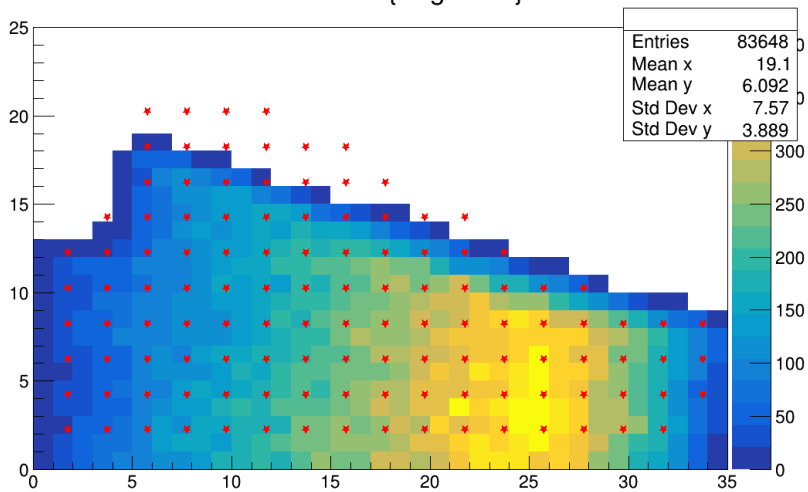
Thank You!

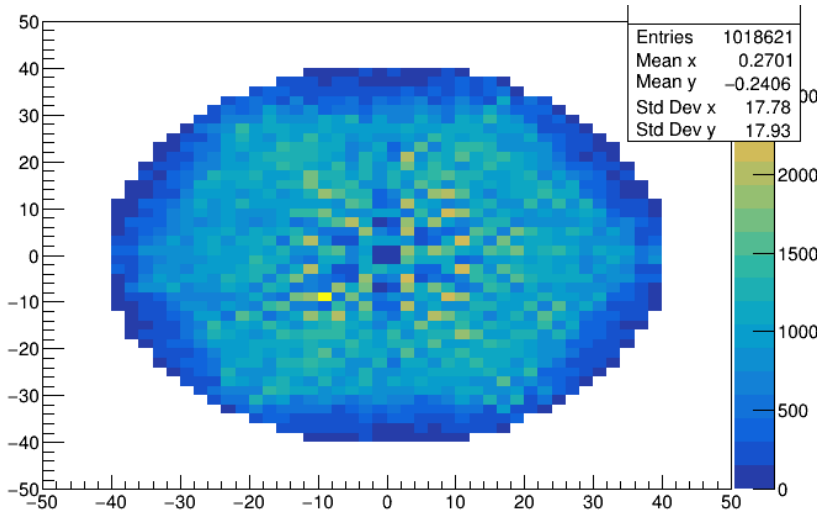
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spectrum	LP width	RP width	LP E (keV)	RP E (keV)
ADL	6.6(2.1)	4.7(1.1)	1336(4)	1345(3)
x+2	6.1(2.0)	4.4(0.9)	1335(3)	1345(3)
x+4	7.1(2.3)	4.6(1.2)	1336(3)	1345(3)
x+5	6.9(2.5)	4.6(1.1)	1336(4)	1345(3)
y+2	7.0(3.0)	4.6(1.4)	1336(3)	1345(3)
z+1	7.3(1.6)	4.8(0.9)	1336(3)	1345(3)
z+2	7.1(2.3)	4.4(1.5)	1336.5(20)	1345.7(21)
z-1	6.2(2.2)	4.5(1.2)	1335(3)	1345(3)
z-2	6.7(2.4)	4.6(1.3)	1335(3)	1344(3)