

PSA : Comparison ADL simulated basis with the IPHC scanned basis

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*Supported by the P2IO excellence center

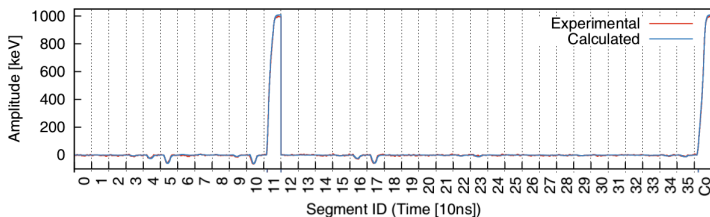


- Introduction
- Scanning of an AGATA detector
- Comparison ADL-IPHC
- Outline

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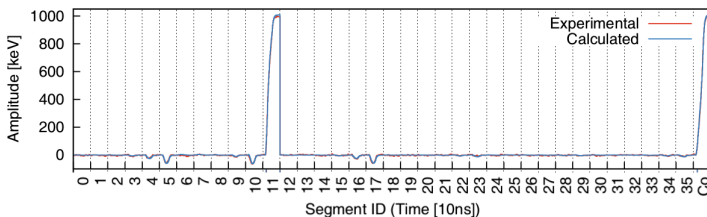
Basic principle of the PSA

B. Bruyneel et al. Eur. Phys. J. A. 52, (2016)



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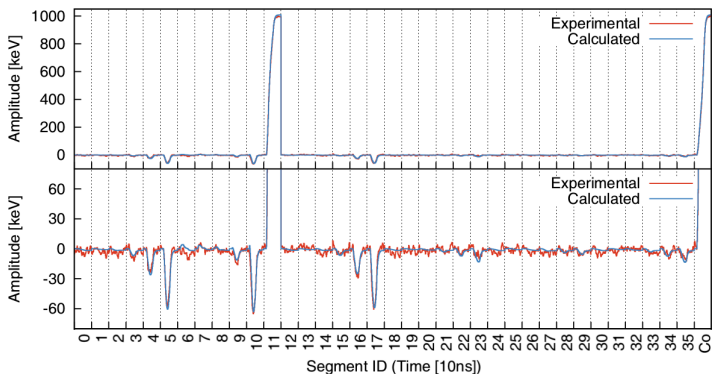


Grid-search algorithm used online

R. Venturelli, LNL annual report 2004

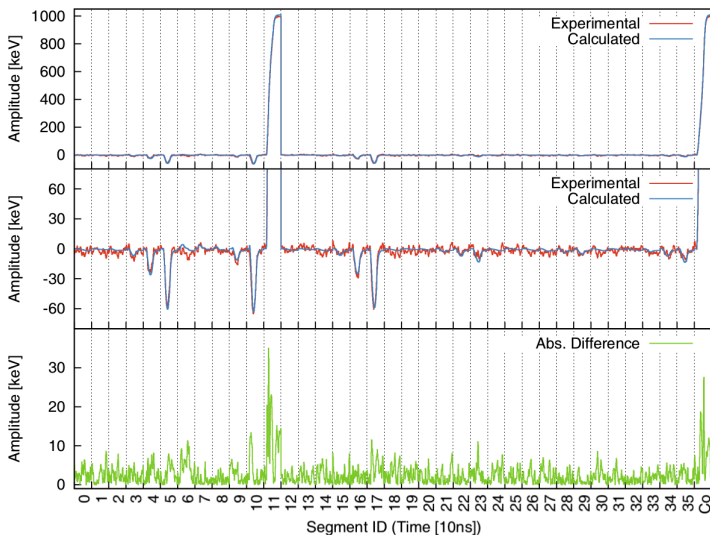
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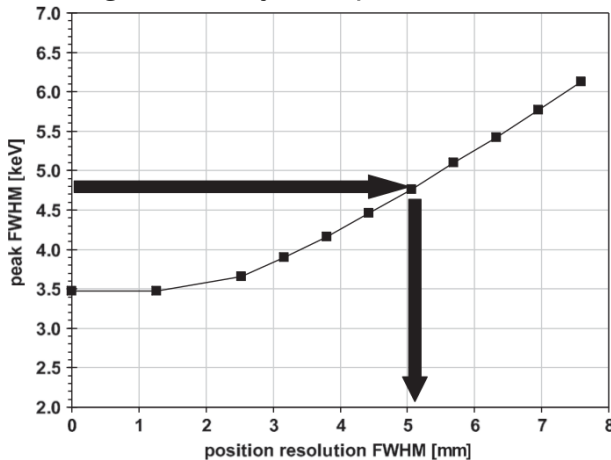


Basic principle of the PSA

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Resolution obtained after Doppler correction of 1382 keV *gamma* ray compared with simulations



How to have a basis of signals?

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So far we used ADL simulated bases *B. Bruyneel et al. Eur. Phys. J. A. 52, (2016)*

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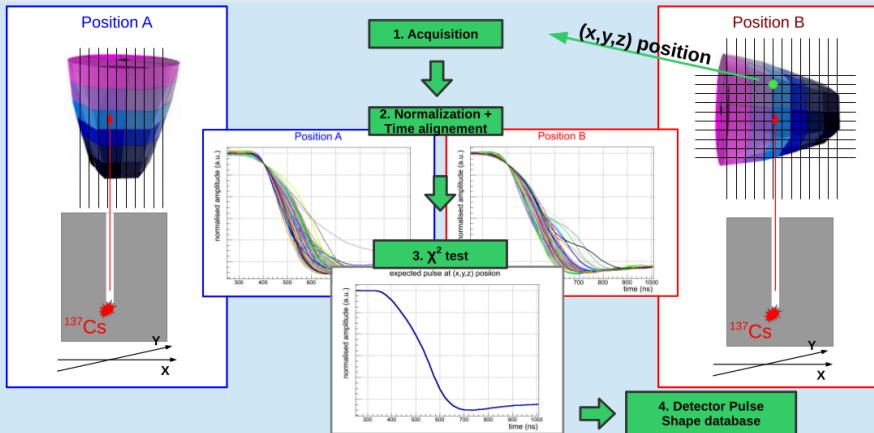
But could we do better?

Use of scanned basis.

Use of scanned basis.

Principle: Pulse Shape Comparison Scan Technique

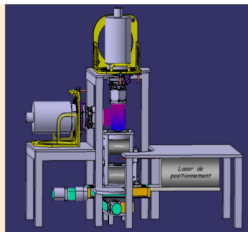
48500 points of an AGATA crystal : 2 weeks of scan, 1 week offline analysis



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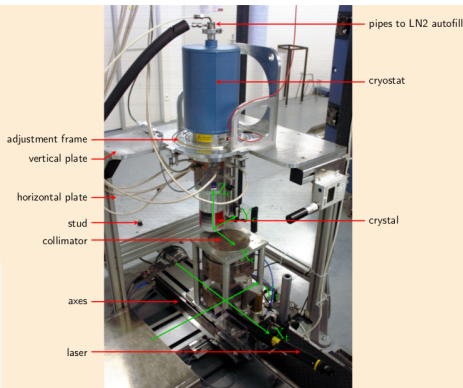
Strasbourg scan table: see F. Didierjean talk

Courtesy: M. Ginsz, G. Duchene, F. DidierJean



In a nutshell

- positioning frame
- overall positioning $\pm 50 \mu\text{m}$
- collimated γ -ray
 - $\varnothing 1.6 \text{ mm}$ along 165 mm
 - ^{241}Am , 60 keV , $\sim 90 \text{ ct/s}$
 - ^{137}Cs , 662 keV , $\sim 900 \text{ ct/s}$
- electronics : TNT2 boards



Full scan of an AGATA detector

Full scan of detector 006B in 2015

Full scan of an AGATA detector

Full scan of detector 006B in 2015

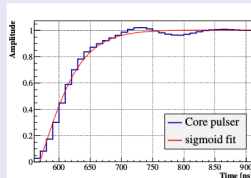
Cf. M. Ginsz thesis and AGATA-week 2015 talk

Including the electronic response

Courtesy: M. Ginz

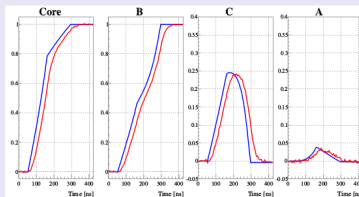
Electronic filter (FETs → preamp → digitizers)

- $s(t) = \left(\frac{\delta}{\delta + \frac{\kappa^2}{1 + \kappa^2} \cdot e^{-\frac{\sqrt{2} \cdot t}{\delta}}} \right) \cdot e^{-\frac{(t-t_0)}{t_d}} - \frac{\delta}{2}$
- $\kappa = 23.8 \rightarrow$ slope
- $\delta = -2 \rightarrow$ amplitude
- $t_0 = 569 \rightarrow$ time @ zero amplitude
- $t_d = 50000 \rightarrow$ preamp decay
- final risetime : ~95 ns**

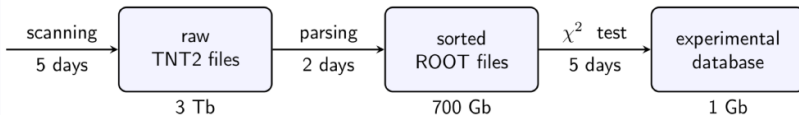


Simulated perfect pulse after electronic filter + noise → information loss

- strong low-pass filter
- smoothing of edges, kinks ...
- degradation of localization information

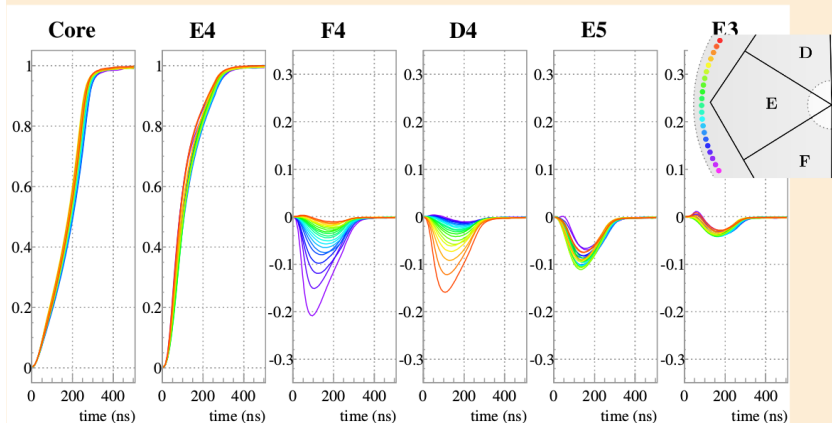


Time needed to establish ONE complete pulse shape database in AGATA from two scans



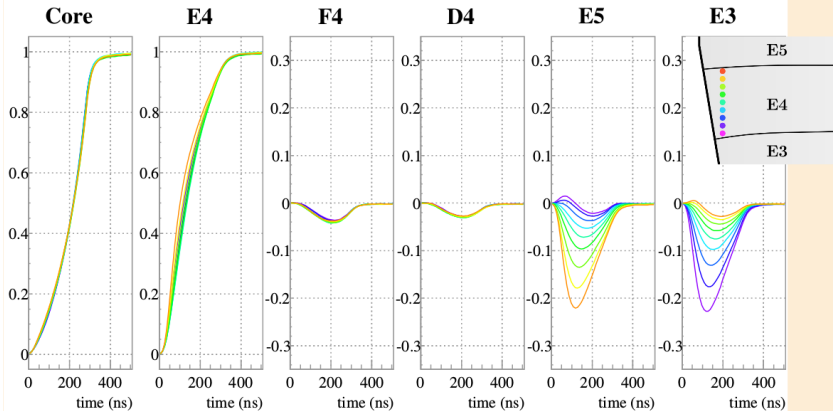
Courtesy: M. Ginsz

Example along azimuth



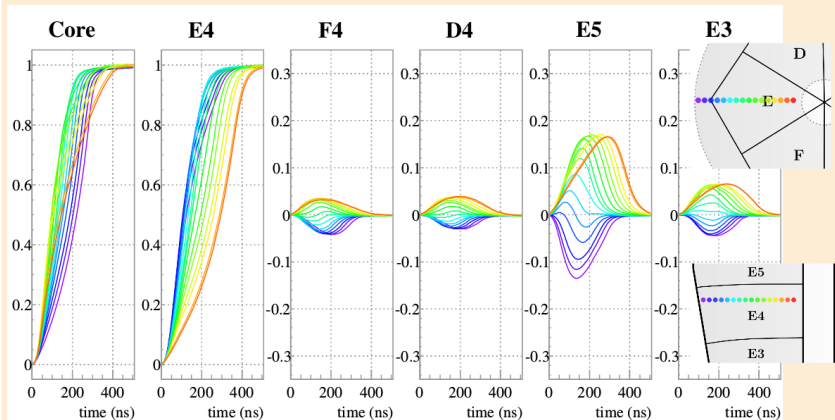
Courtesy: M. Ginsz

Example along depth



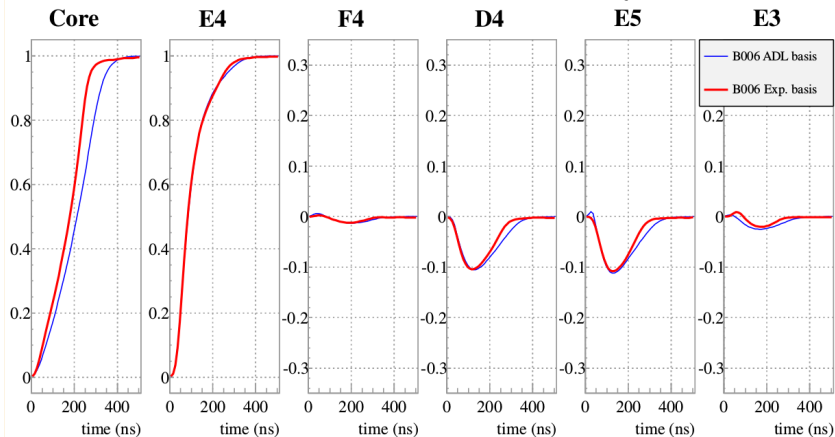
Courtesy: M. Ginsz

Example along radius $Z=50$ mm



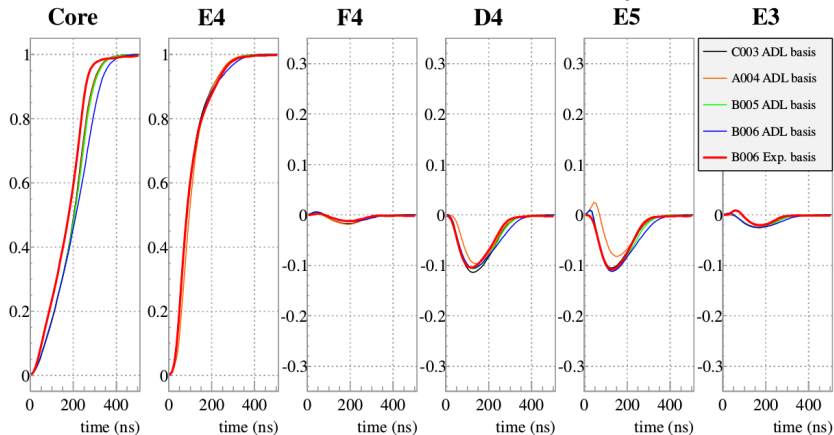
Trace comparison

Courtesy: M. Ginsz



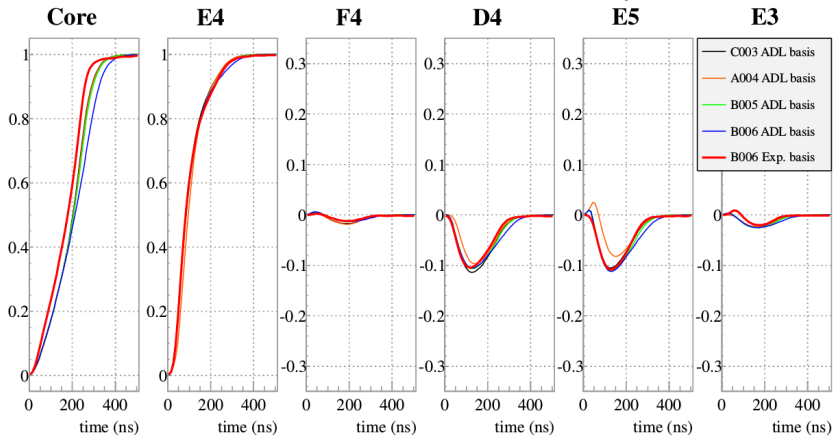
Trace comparison

Courtesy: M. Ginsz



What is the best?

Courtesy: M. Ginsz



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Source measurement: ^{60}Co , ^{152}Eu , ...

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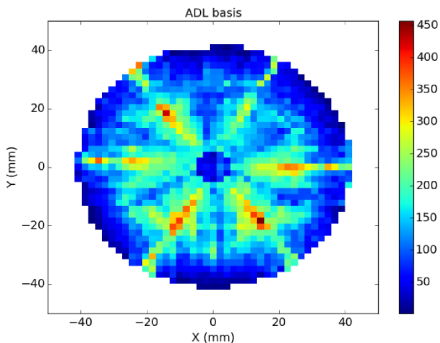
$v/c \sim 0.2$: GANIL data: ^{158}Er

Source measurement: ^{60}Co , ^{152}Eu , ...

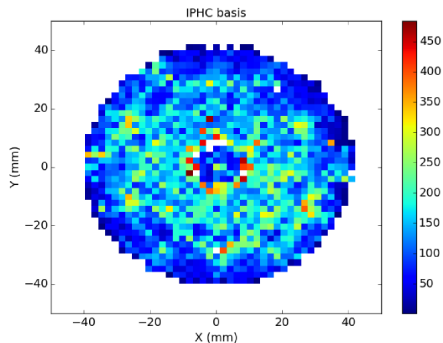
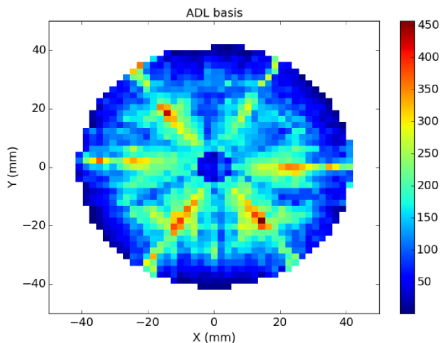
$v/c \sim 0.2$: GANIL data: ^{158}Er

$v/c \sim 0.5$: GSI data: $^{100-108}\text{Mo}$

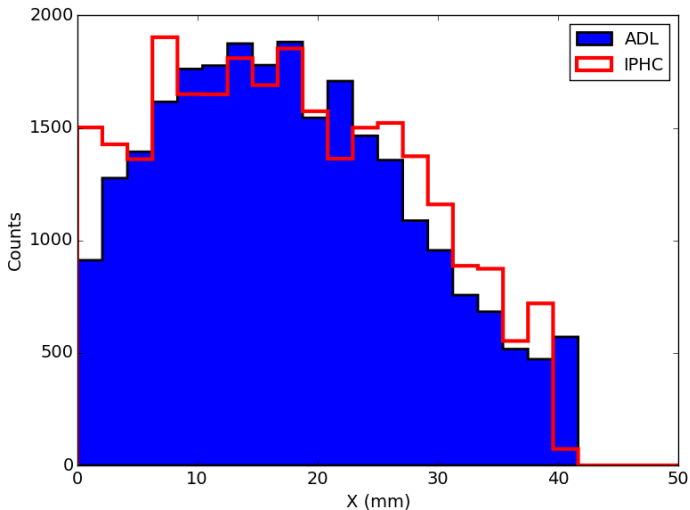
Classic ALD clustering



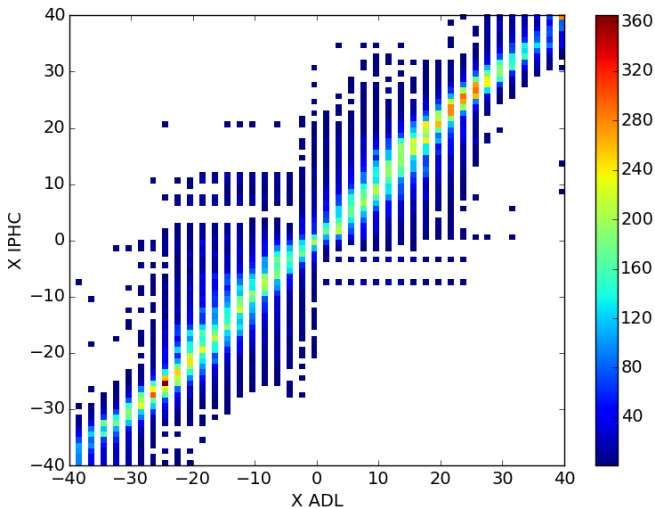
No clear clustering



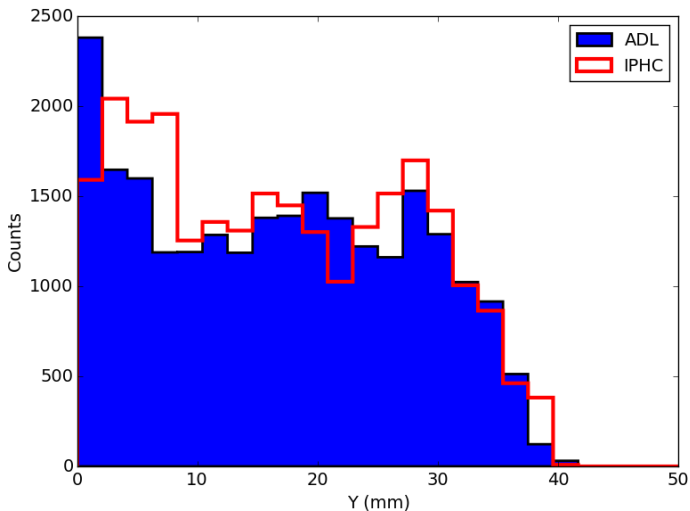
Small difference in X histogram



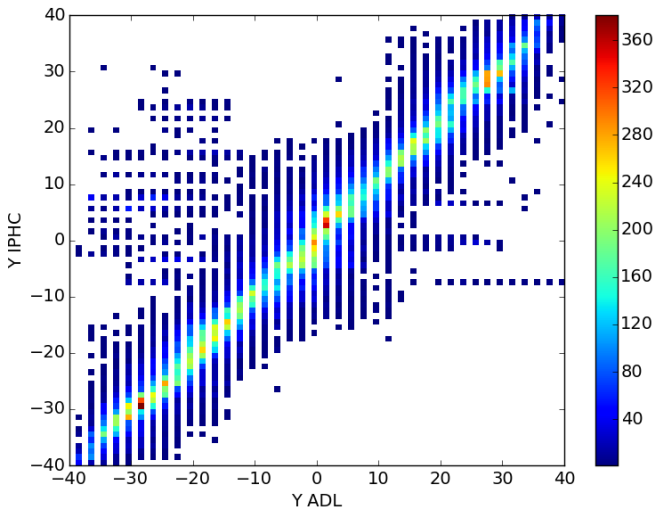
X-ADL versus X-IPHC



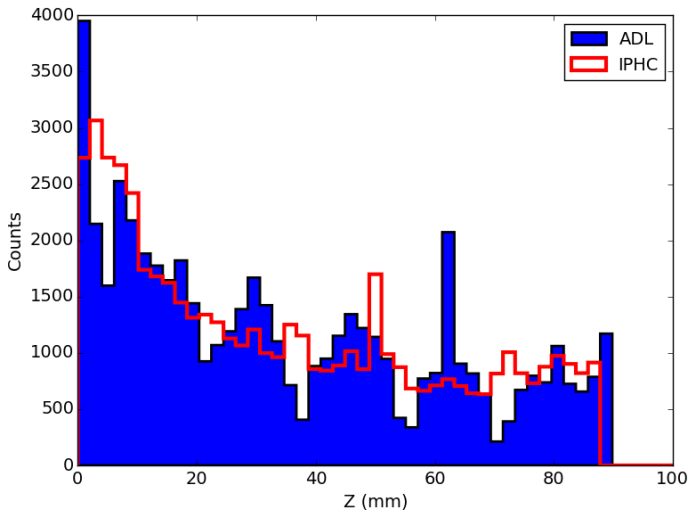
Small difference in Y histogram



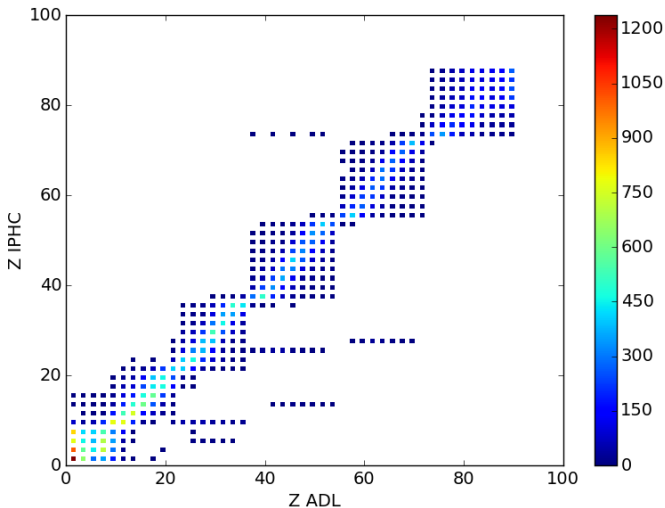
Y-ADL versus Y-IPHC



Small difference in Z histogram



Z-ADL versus Z-IPHC



$$v/c \sim 0.2$$

Using a B type detector with both ADL and IPHC
basis

$$v/c \sim 0.2$$

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No clear difference observed after Doppler correction

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Using a B type detector with both ADL and IPHC
basis

No clear difference observed after Doppler correction

Some additional verification are needed in the hit
distribution with tracking algorithm

Standard ADL data base for each detectors

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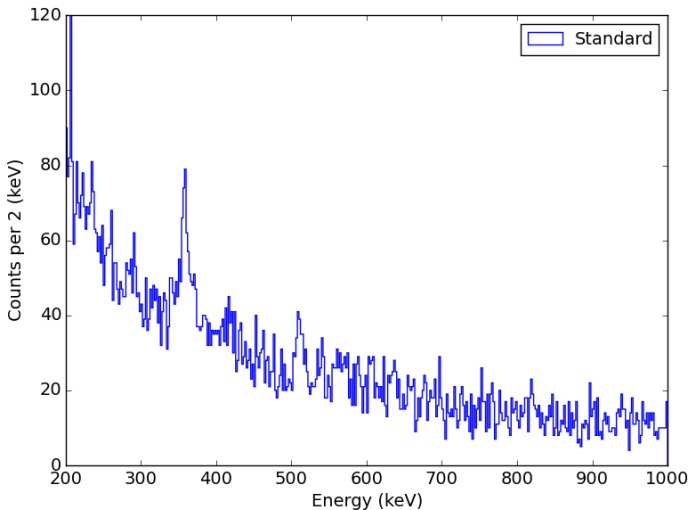
Using an ADL base for detector B and apply it to all
17 AGATA detectors

Standard ADL data base for each detectors

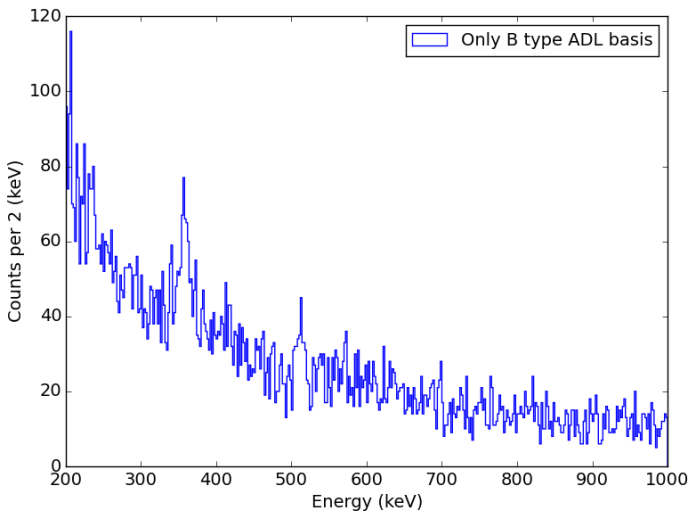
Using an ADL base for detector B and apply it to all
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Utilisation of the IPHC scan basis (type B) for all
the 17 AGATA detectors

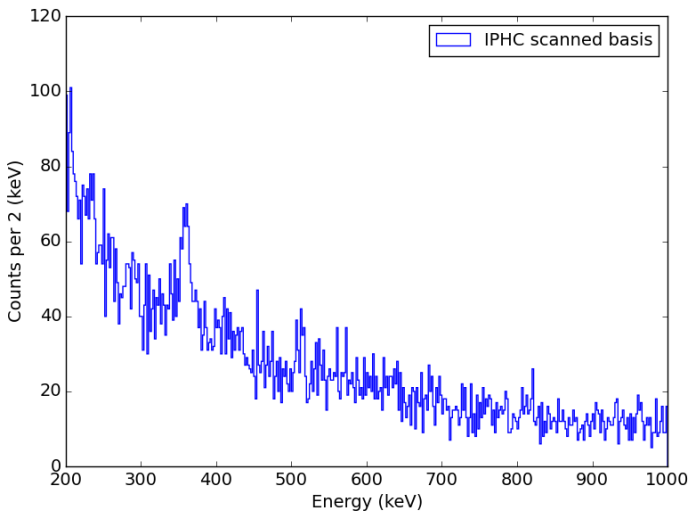
Standard ADL data base



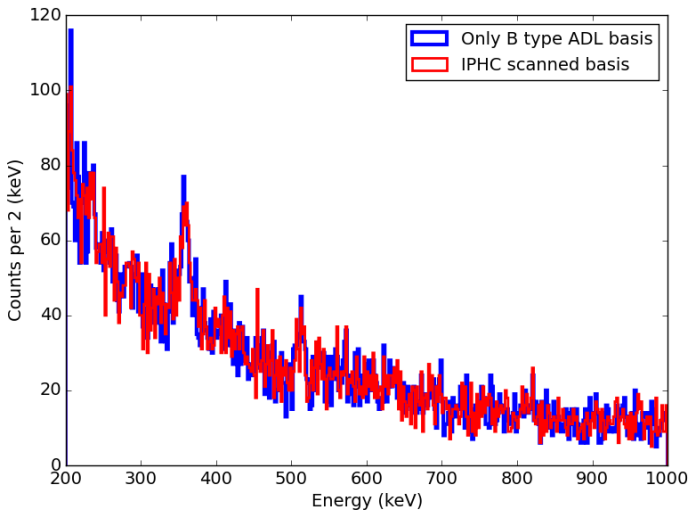
Only one ADL data base, B type, for all detectors



Only scanned IPHC data base for all detectors



Comparison:



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- Optimisation of the preamplifier response?
- Utilisation of the core trace for PSA minimization

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Ideas?

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