RoI size construction using the LAr information and and implementation of the reduced RoI using IDScan.

Outline:

- ***Quick reminder of the LAr ATLAS Calorimeter.***
- ***Quick reminder of IDScan LVL2 Trigger Algorithm.***
- ***How the RoI is currently constructed.***
- ***Reducing the RoI size: Motivation – Main Tool.***
- ***Technicalities - Methodology.***
- ***Results:***
  1. ***Zvtx Resolution from Calorimeter and IDScan.***
  2. ***The new RoI.***
  3. ***IDScan performance with the reduced SP.***
- ***Conclusions - Next Steps.***

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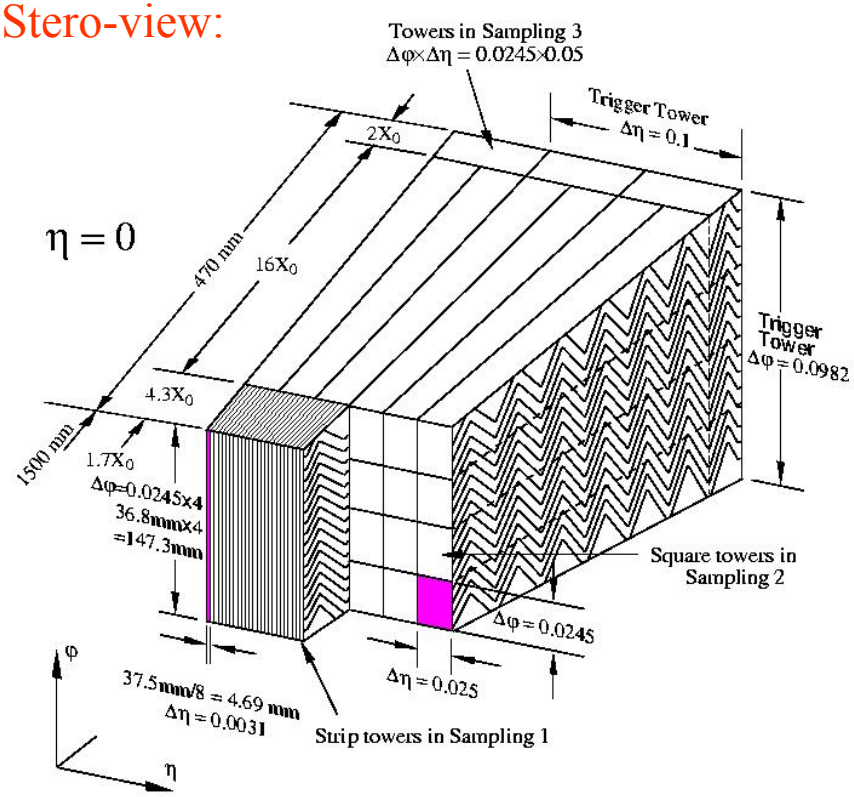
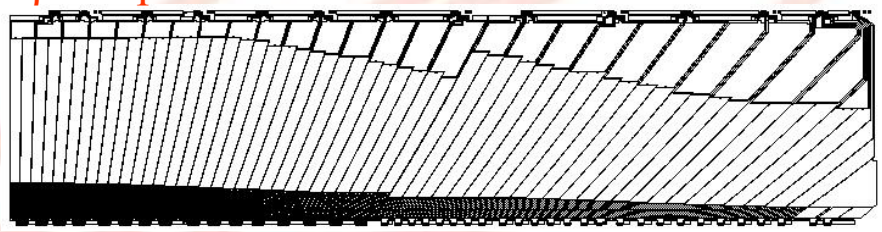
Quick reminder of the LAr ATLASCalorimeter.

Stero-view:

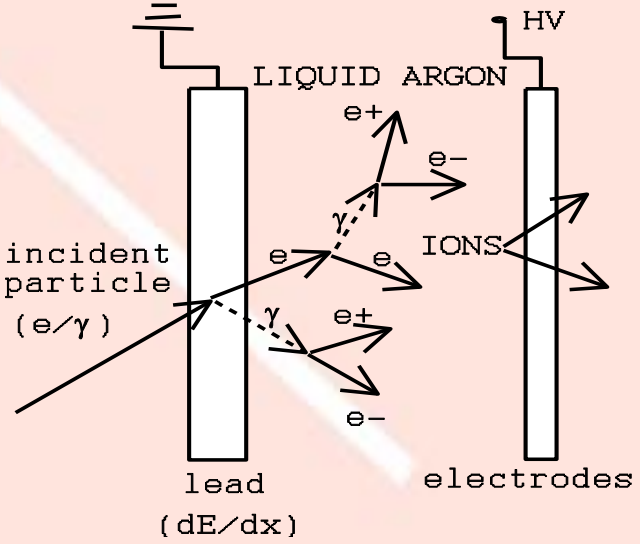


ρ – z plane:



1. 3 samplings.
2. The boundaries are determined by the size of the electrodes read-out
3. 1^{st}: (Δη x Δφ) =(0.003 x 0.1)
   2^{nd}: (Δη x Δφ) =(0.025 x 0.025)
   3^{rd} : (Δη x Δφ) =(0.1 x 0.1)

Physics processes:



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Quick reminder of IDScan LVL2 Trigger Algorithm.

- Track reconstruction inside the Inner Detector.
- Uses the Space Points from Pixel and SCT detectors.
- Space Points inside the Region of Interest (RoI)

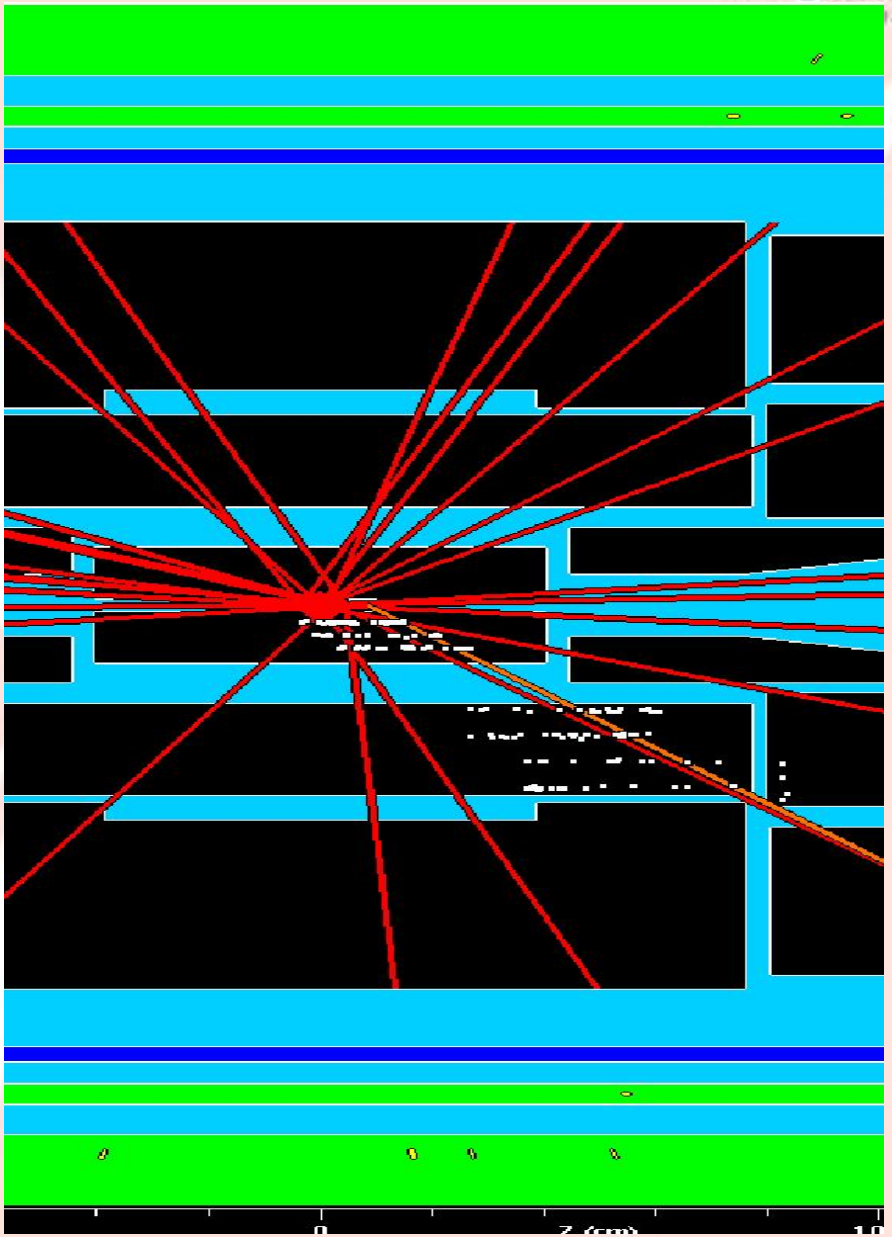
How the RoI is currently constructed.

- Take the information from LVL1 Calo : (η,φ) of the **active** region. The η coordinate is calculated w.r.t to z=0
- Construct the shape of the RoI:

  $z=0 \pm 168$ mm ($\cong 3\sigma$ of the beam spread)

  $\eta \pm 0.1$

  $\varphi \pm 0.1$ rad



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Reducing the RoI size: Motivation – Main Tool.

Motivation:

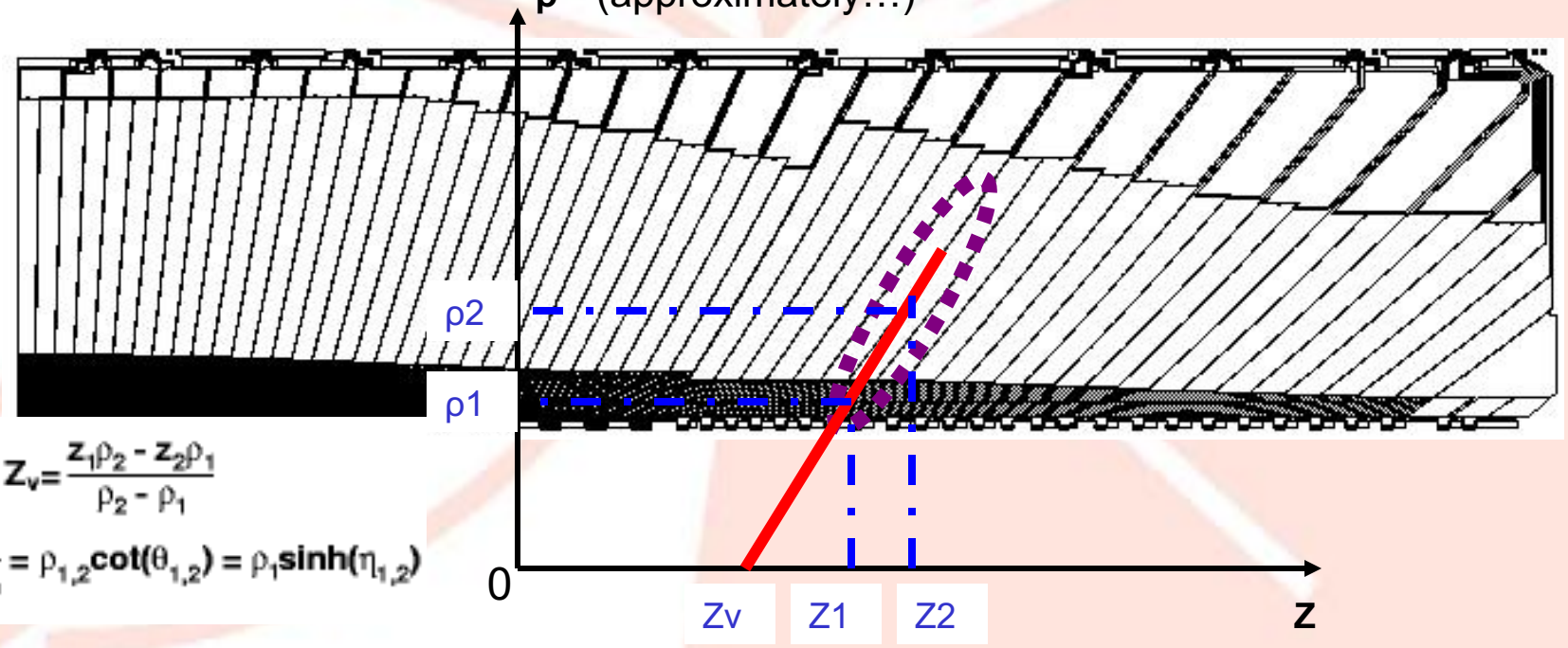
Optimize the size of the RoI.

- **Less Space Points.**
- **Less Combinatories.**
- **Quicker Algoritms.**
- **Improve efficiency.**

Main Tool:

The shower position at the 1st and 2nd EM sampling.

ρ1 = 154.53 cm
ρ2 = 175.92 cm
(approximately…)



$$Z_v = \frac{z_1\rho_2 - z_2\rho_1}{\rho_2 - \rho_1}$$

$$z_{1,2} = \frac{\rho_{1,2}}{\tan(\theta_{1,2})} = \rho_{1,2}\cot(\theta_{1,2}) = \rho_1 \sinh(\eta_{1,2})$$

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Technicalities - Methodology.

- Use 500 events with 25 GeV (Simulated - Low Luminosity) electrons and with 30 GeV (High Luminosity) .
- Run ATHENA (rel. 9.0.0) under RecExCommon-00-02-79 (and TrigRelease-00-01-89).
- For each event get:
  - •The cluster information at each of the 3 samplings (+ pre-sampler)
  (!! LAr offline reconstruction code. Unfortunately still problems with T2Calo)
  - •The space points information.
- Perform the analysis offline:
  - •Determine the z position of the primary vertex using the information from the Calorimeter.
  - •Construct the RoI:
    - Open $Zv \pm 1.96\sigma$ of the resolution on Z (fixed or parametrized).
    - Still need to determine the amount for opening θ. Use the position resolution of the samplings. For the moment keep the θ as it is calculated from the samplings.
  - •Select the SP inside the new RoI.
  - •Run IDScan with the Reduced SP.
  - •THANK YOU MARK FOR MAKING IDSCAN RUN OFFLINE!!!!!

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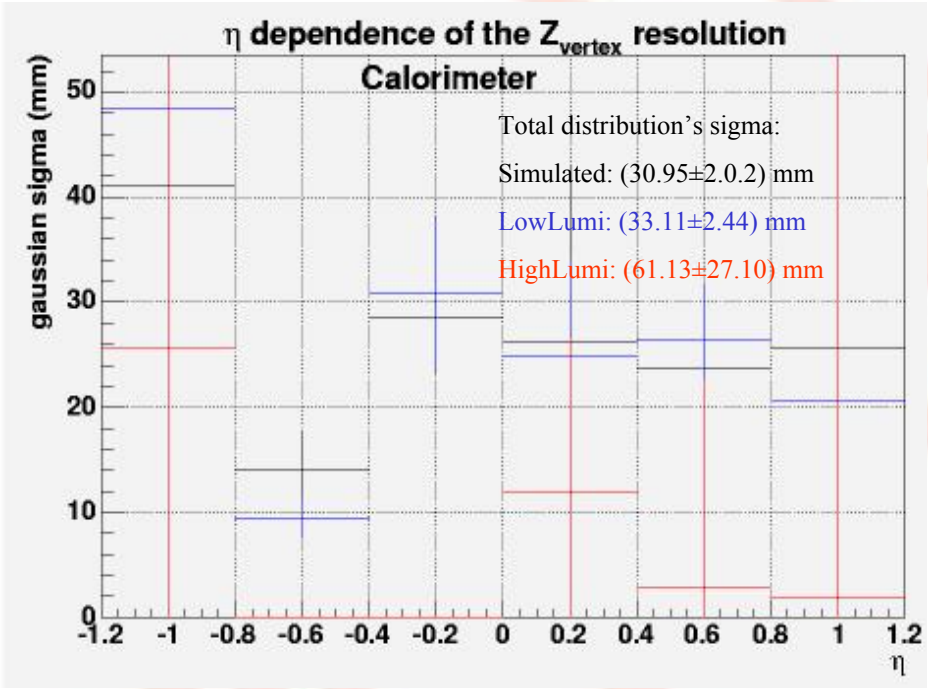
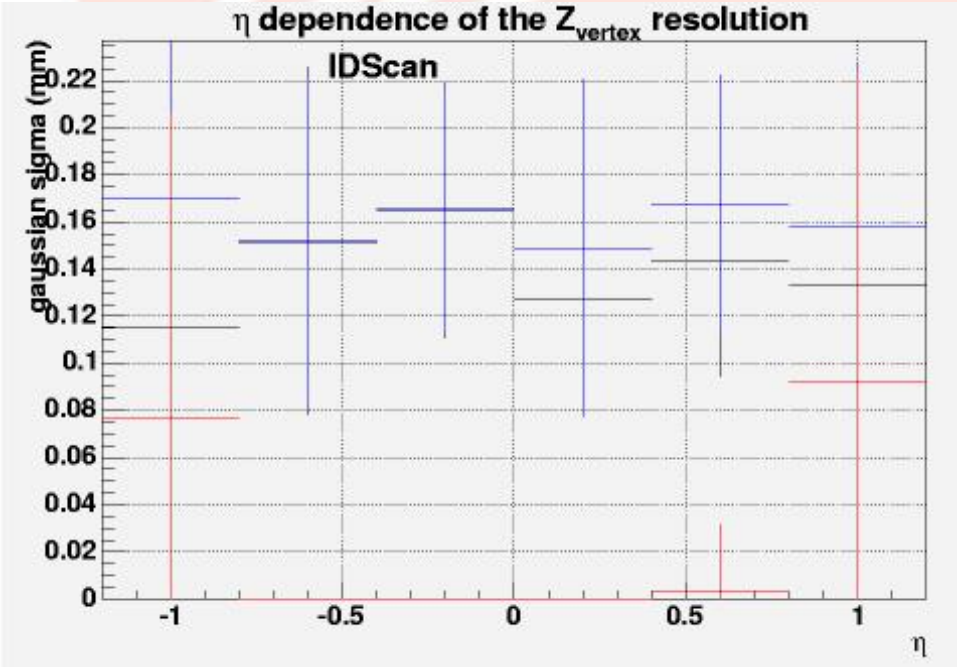
Results: Zvtx Resolution from Calorimeter and IDScan.

- Use only purely barrel clusters: $|\eta| \leq 1.2$
- For high luminosity runs, there is very not statistics (<80 RoI's)
  $\Rightarrow$ Work for the moment with low luminosity and simulated events.
- Parametrize the width to construct the new RoI as a function of η.





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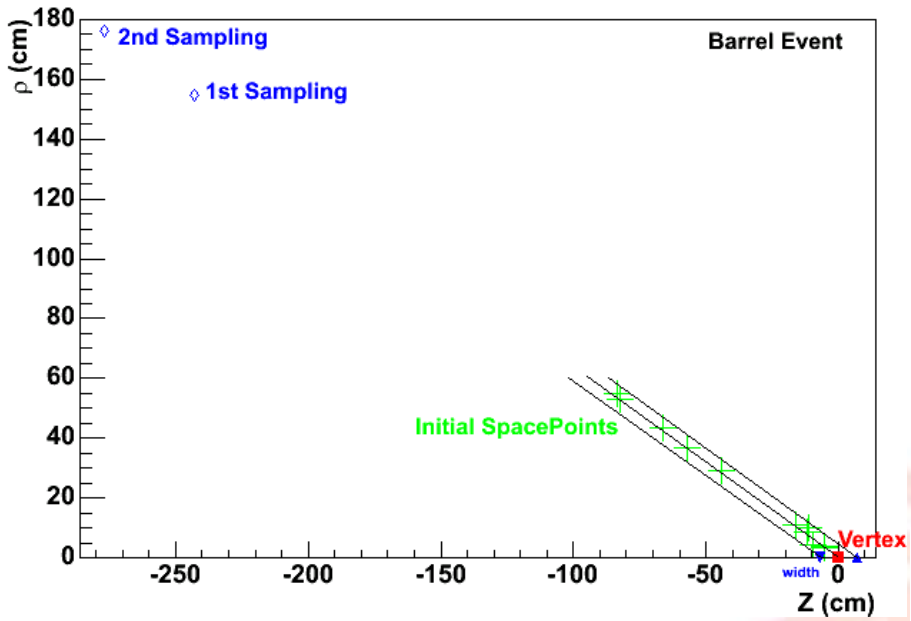
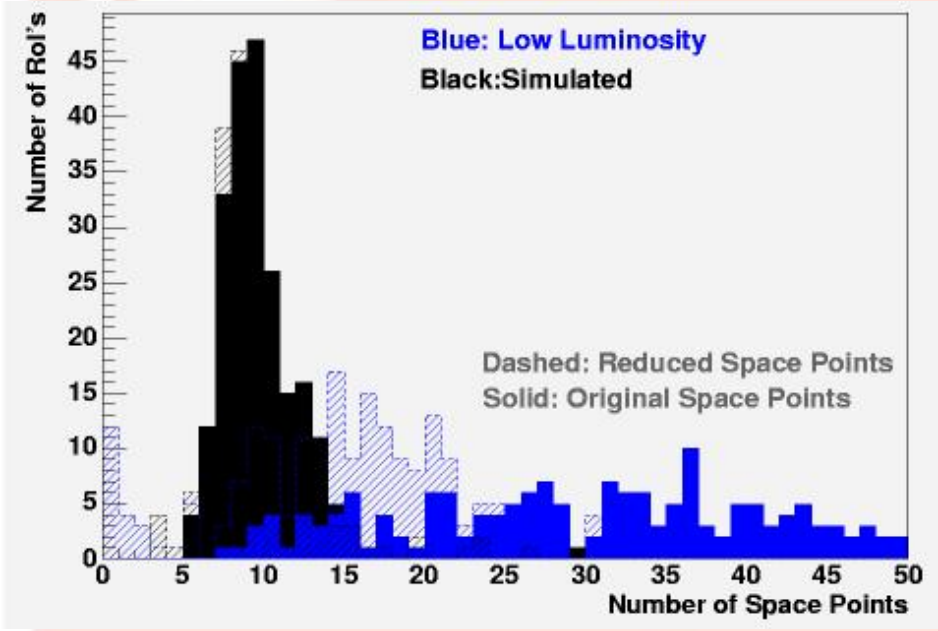
Results: The new RoI.





No real effect with the simulated events, but important shift with the LowLumi events.

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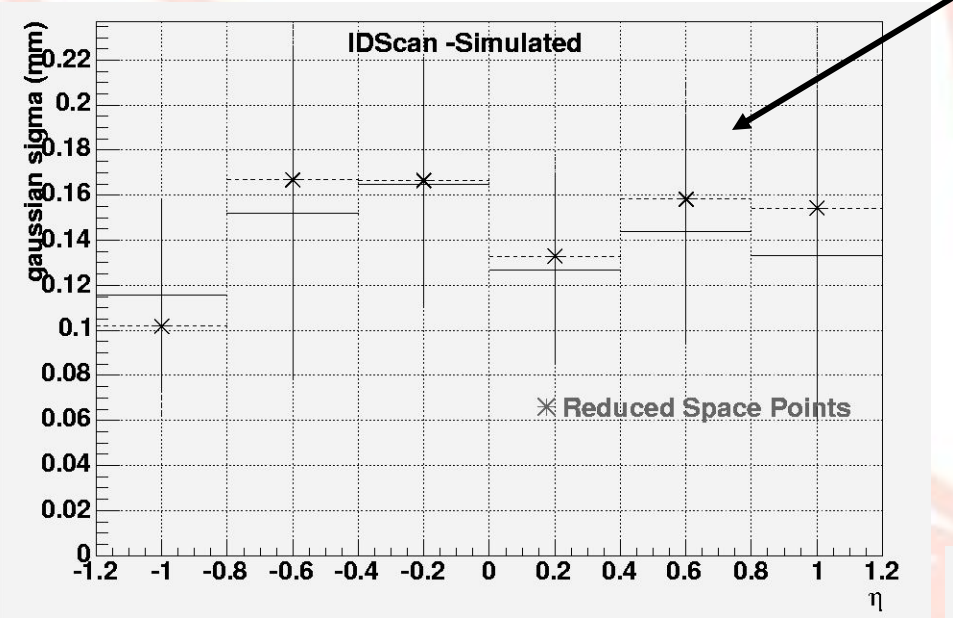
Results: IDScan performance with the reduced SP.

Worse with the simulated events???



Overall gaussian sigma (mm)	Original Space Points	Reduced Space Points
Simulated events	0.110±0.010	0.112±0.011
LowLumi events	0.139±0.013	0.122±0.040

Better with the LowLumi events???

****In the case of the Simulated events we throw away real SP, but in the LowLumi events we throw away noise…**

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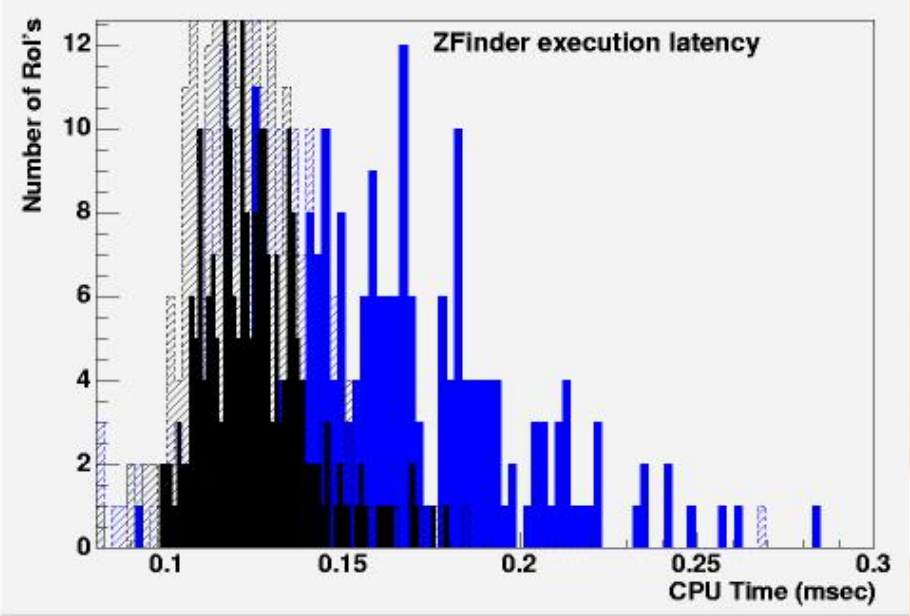
Results: IDScan performance with the reduced SP.

Timing Performance



Mean Value (msec)	Original Space Points	Reduced Space Points
Simulated events	0.125	0.122
	-2.56% →	
LowLumi events	0.164	0.1306
	-20.37% →	

Efficiency: $|Ztrue - Zidscan| \leq 0.1$ mm

	Original Space Points	Reduced Space Points
Simulated events	53.22%	49.78%
	-6.46% →	
LowLumi events	45.50%	42.80%
	-5.93% →	

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Conclusions.

- The new RoI as constructed using the LAr Calorimeter seems to improve the resolution in finding the Zvtx.
- Negligible lose of efficiency compared to time gained for LowLumi.

Next Steps.

- Study the EndCap case. The main problem lies in determining the (approximately constant) Z-position of the samplings.
- Get more events. Increase statistics. Better width.
- Submit more HighLumi events.
- What about physics events?
- What about T2Calo?

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