

PXD Resolution in Large Occupancies

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Outline

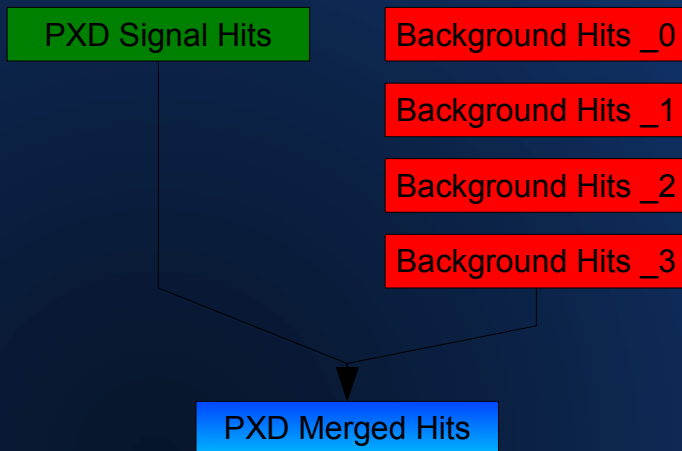
- ILC Software (Marlin) → new implementation of background simulations + added effects of ganged pixels in simulation of PXD response
 - *MergeBackground*: new Marlin processor merging signal Mokka hits with background hits (Belle II QED background) into common ILC collection (PXD, SVD, CDC)
 - *SiPxlDigi*: Marlin processor improved with simulation of effects of ganged pixels
- PXD resolution studies in large QED background (~ % PXD occupancy studies) performed – preliminary results
 - Resolution studies
 - Efficiency studies (resp. inefficiency due to high background)
 - Impact parameter studies (not complete yet)

ILC Software for Belle II – MergeBackground processor

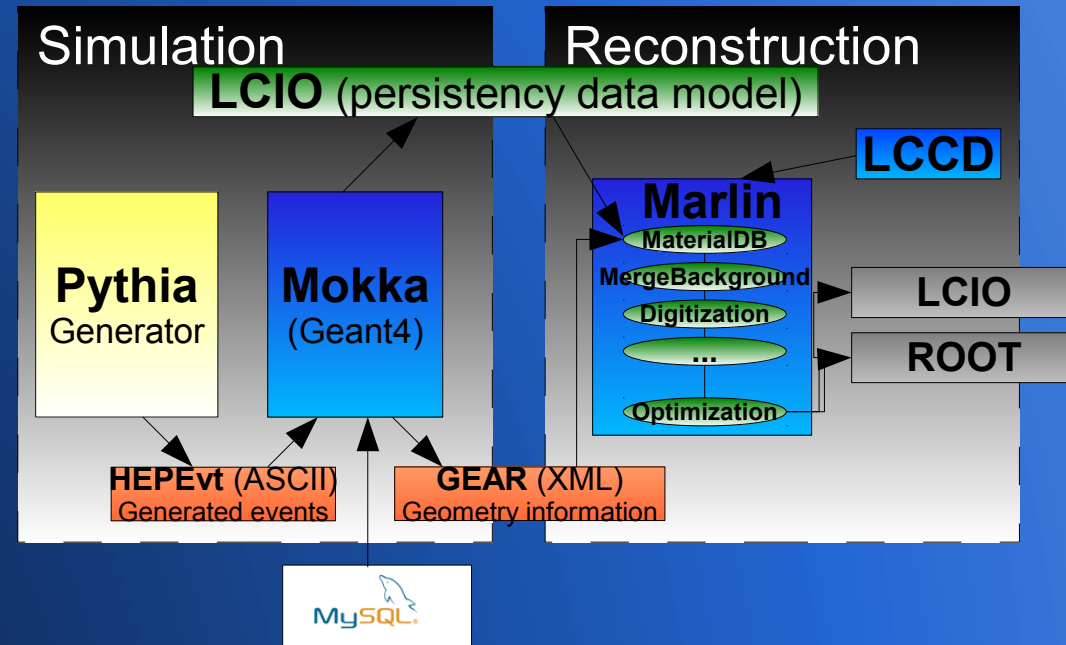
- Marlin processor: *MergeBackground*

- merges together:

- collection of signal hits (physics events)
- collection of background hits (QED background) → overlay several *.slcio files to get required (expected) occupancy



ILC Software Scheme

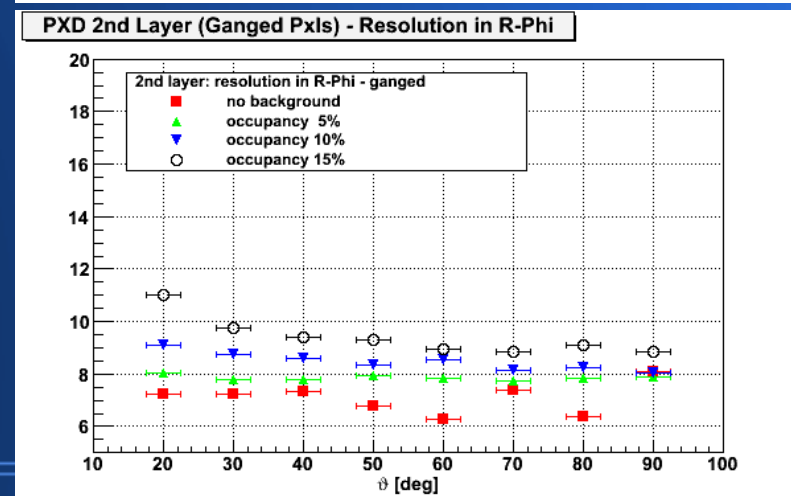
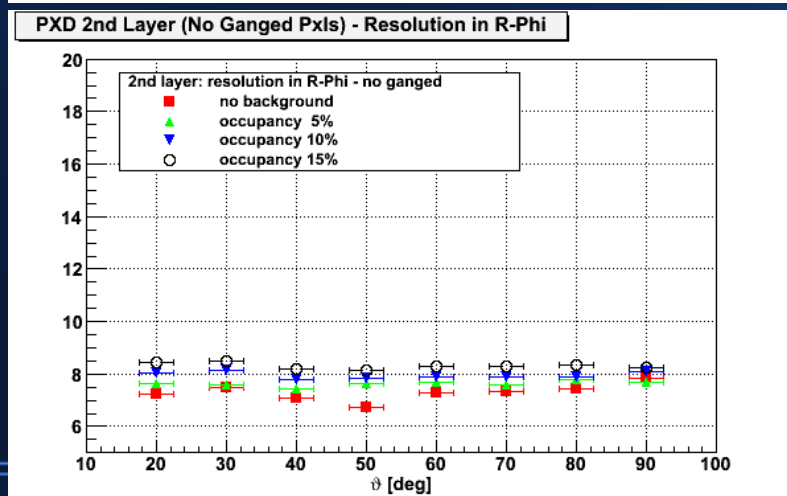
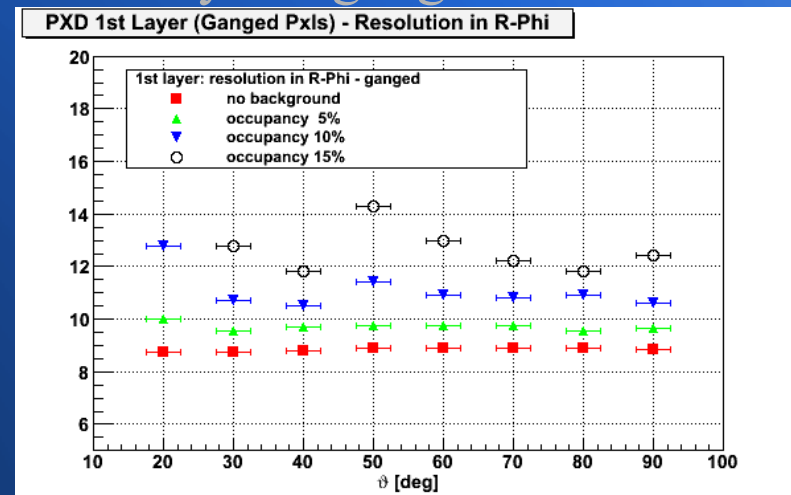
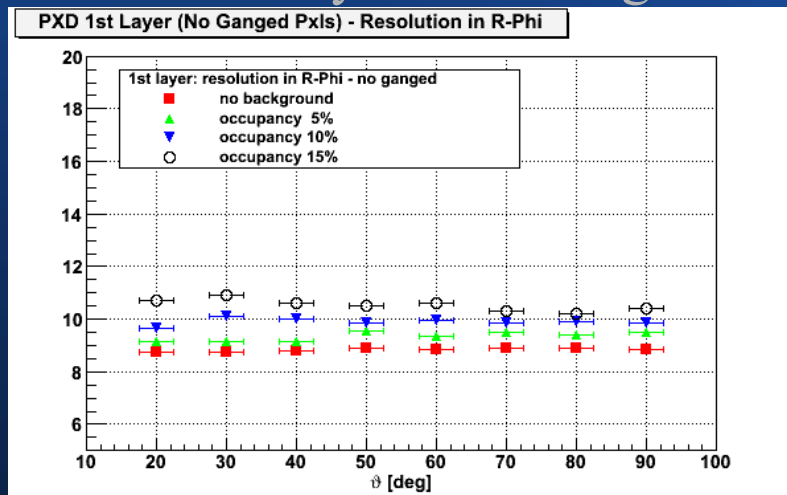


Simulations at Large Occupancies

- Simulated single muon tracks (Mokka, 500MeV) in standard ILC software chain
- Merged signal (muons) & background hits (Belle II QED background) with occupancies:
 - 0 % (no background)
 - 5 – 6 %
 - 10 – 12 %
 - 15 – 18 %
- Studies of DEPFET (no ADC) w/o ganged pixels (2 pixel signals summed up and read-out by common drain; 0 – 400 row, 1 – 401 row, 2 – 402, ...):
 - resolutions in R-Phi & Z, resp. their degradation in “harsh” background
 - TrackerHit efficiency (hit is OK if found by clustering algorithm & if major contribution to the signal is from simulated SimTrackerHit) → nonefficiency degrades resolution: hit found, but not coming from original particle (background effect – hits overlaid) or not found at all (signal/noise too low → clustering doesn't find it)
 - impact parameter resolution & track efficiency

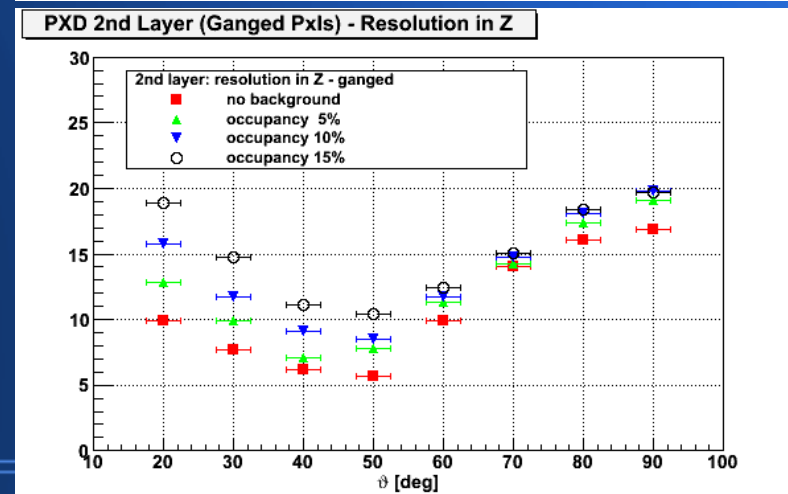
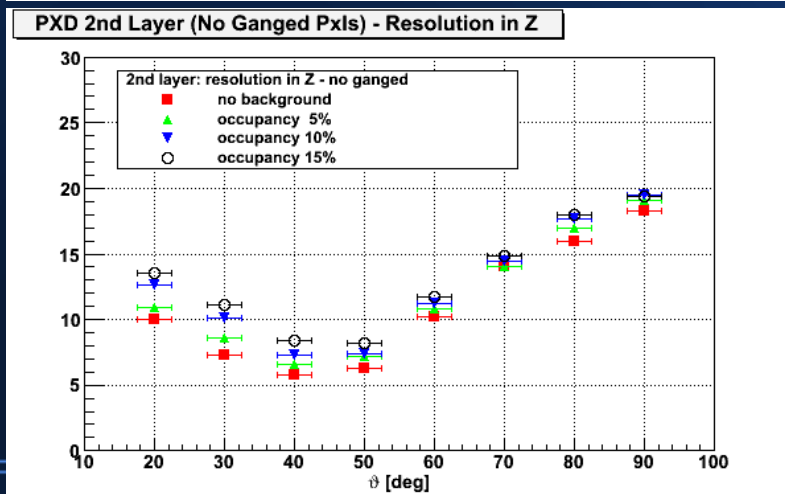
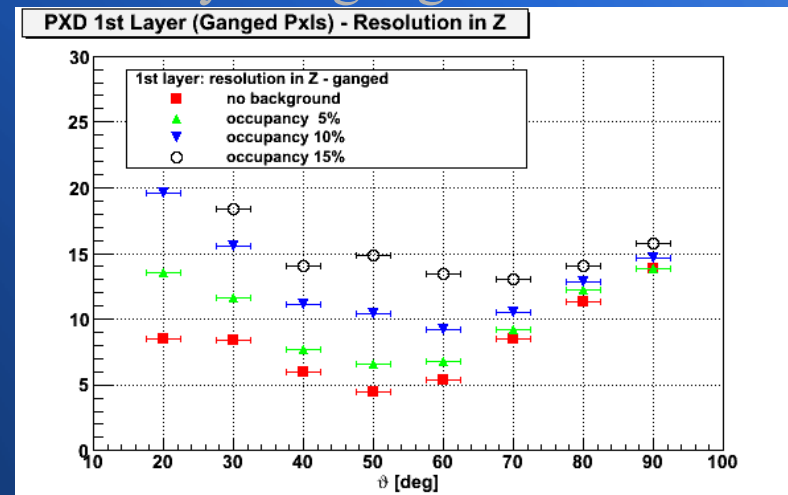
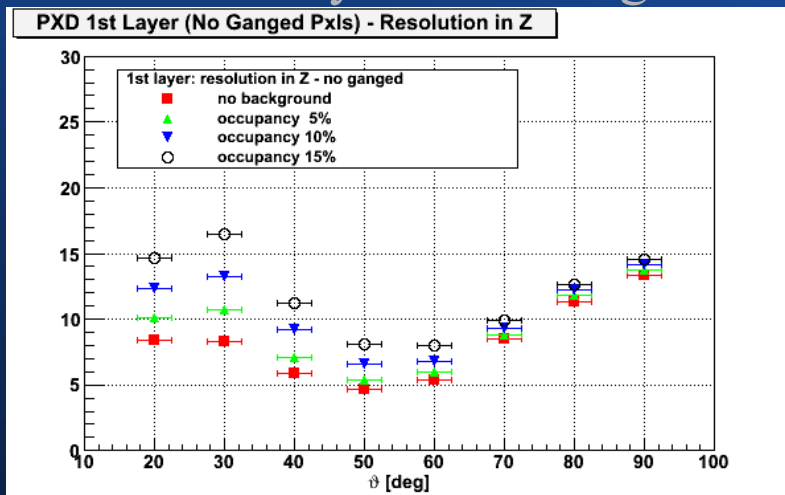
Results: PXD Resolution in R-Phi in Large Occupancies

- Left: 1st & 2nd layer – noGanged x Right: 1st & 2nd layer – ganged



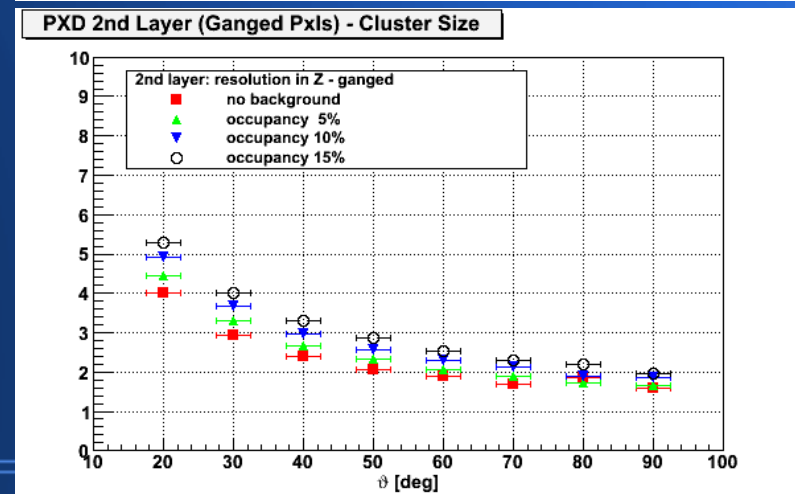
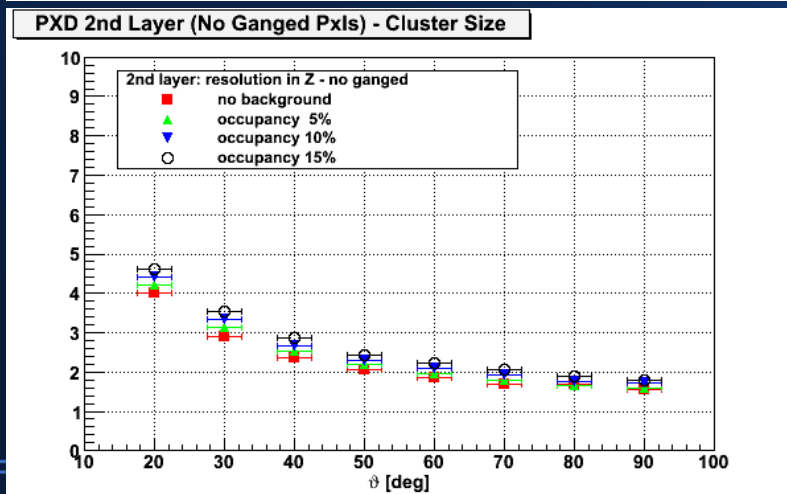
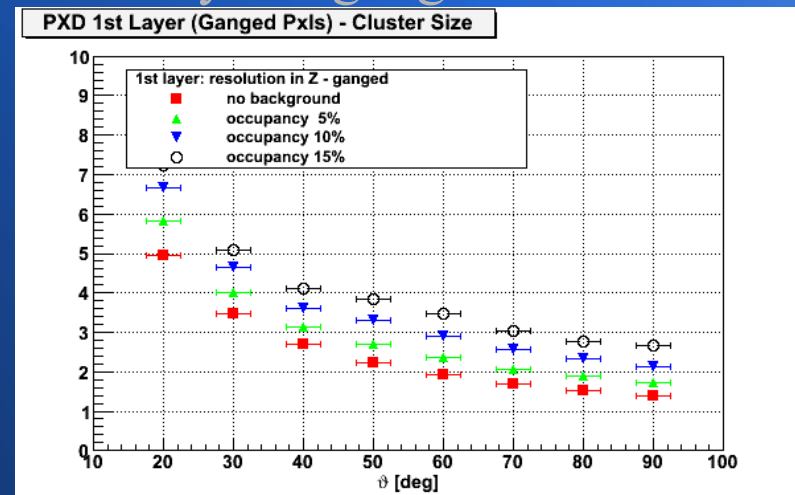
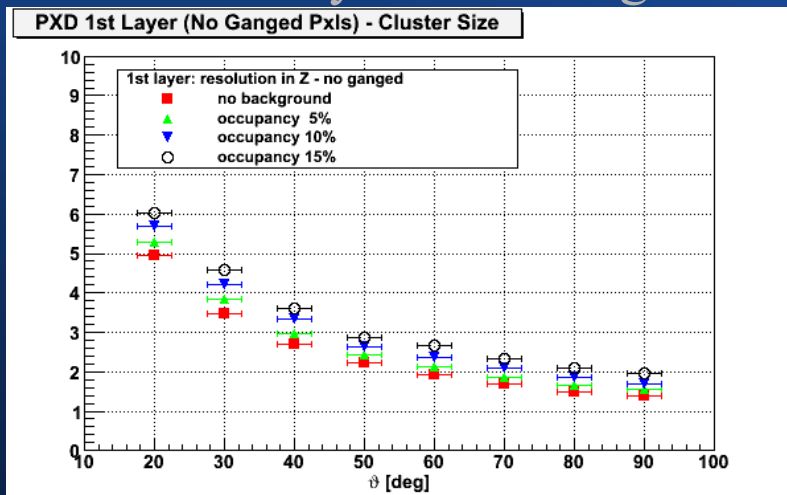
Results: PXD Resolution in Z in Large Occupancies

- Left: 1st & 2nd layer – noGanged x Right: 1st & 2nd layer – ganged



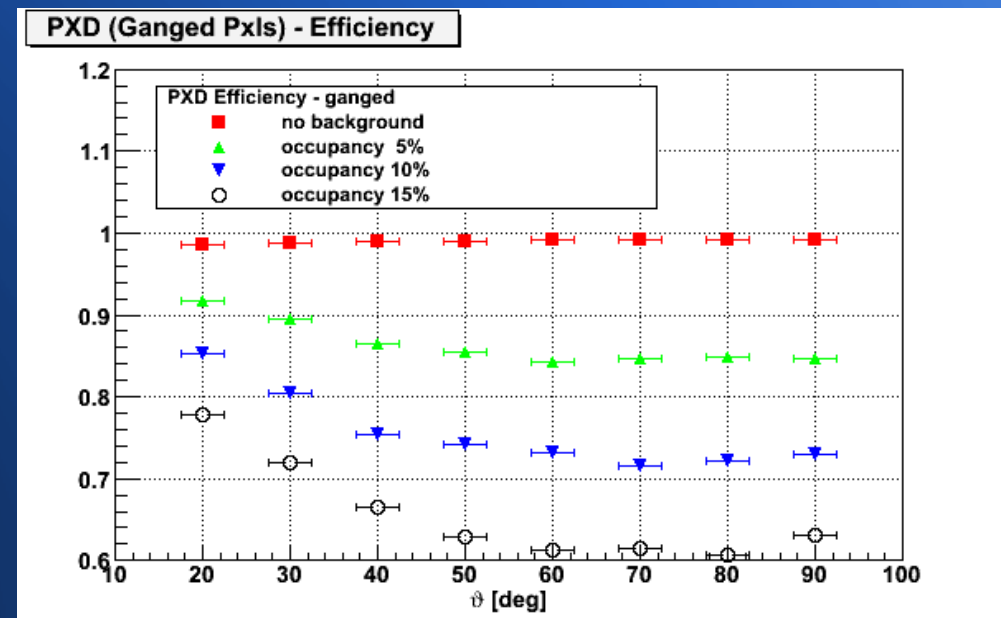
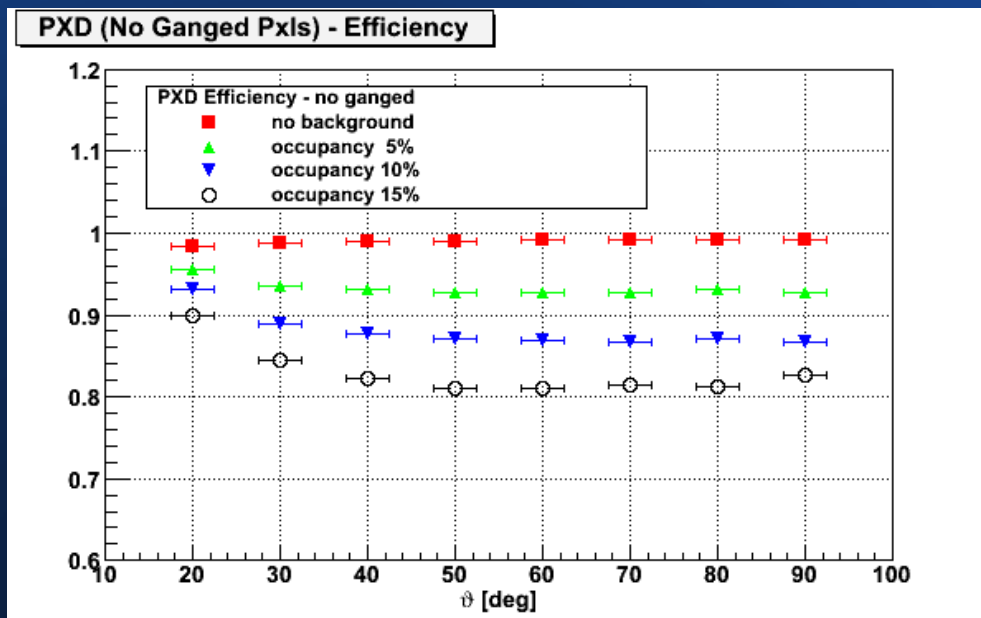
Results: PXD Cluster Size in Large Occupancies

- Left: 1st & 2nd layer – noGanged x Right: 1st & 2nd layer – ganged



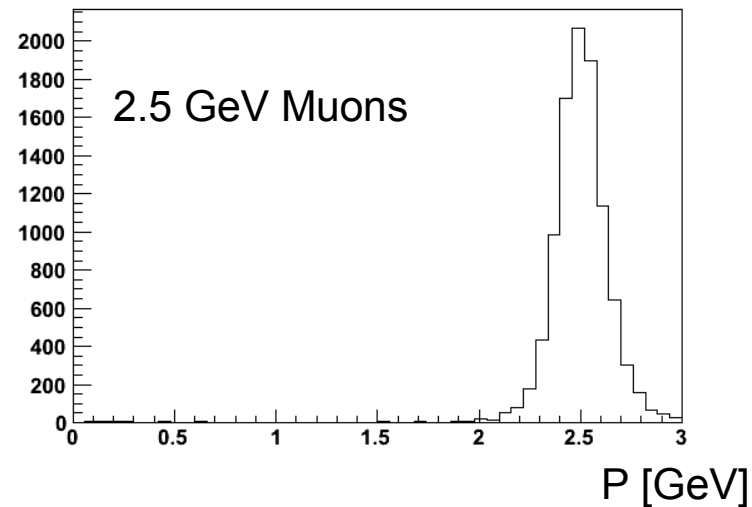
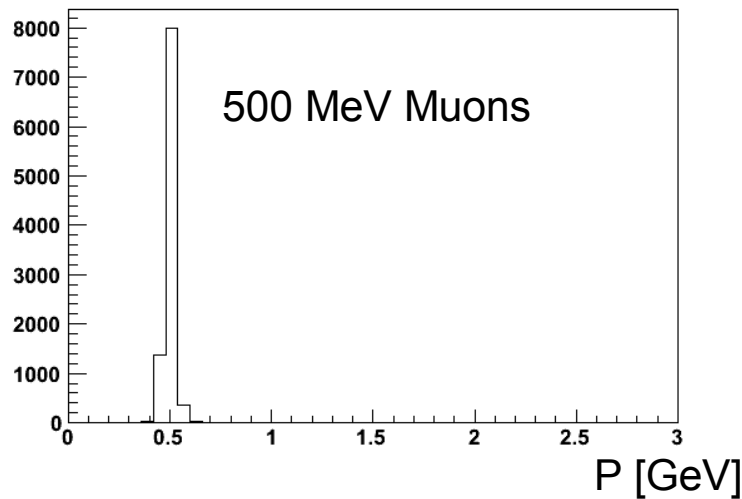
Results: PXD Efficiency in Large Occupancies

- Left: PXD – noGanged x Right: PXD – ganged



Results: Tracking Efficiency

- PXD with ganged pixels + SVD: all in 5 – 6 % occupancy

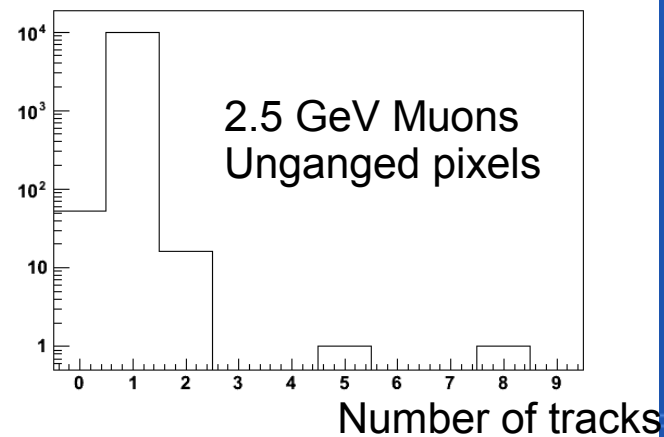
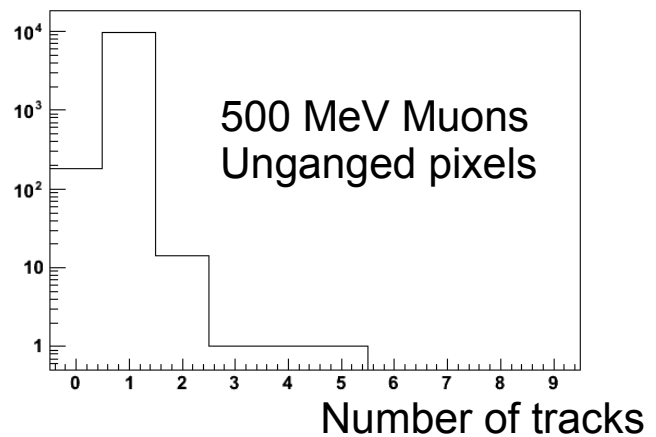
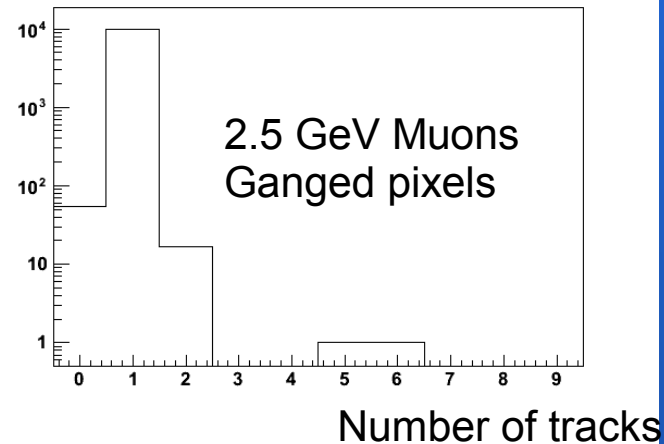
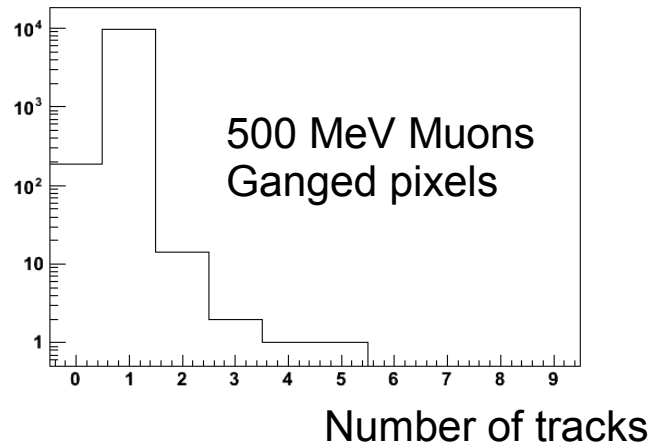


	0.5 GeV Eff.	0.5 GeV Purity	2.5 GeV Eff.	0.5 GeV Purity
ganged	98.15		99.46	
unganged	98.19		99.48	

Error: +- 1%

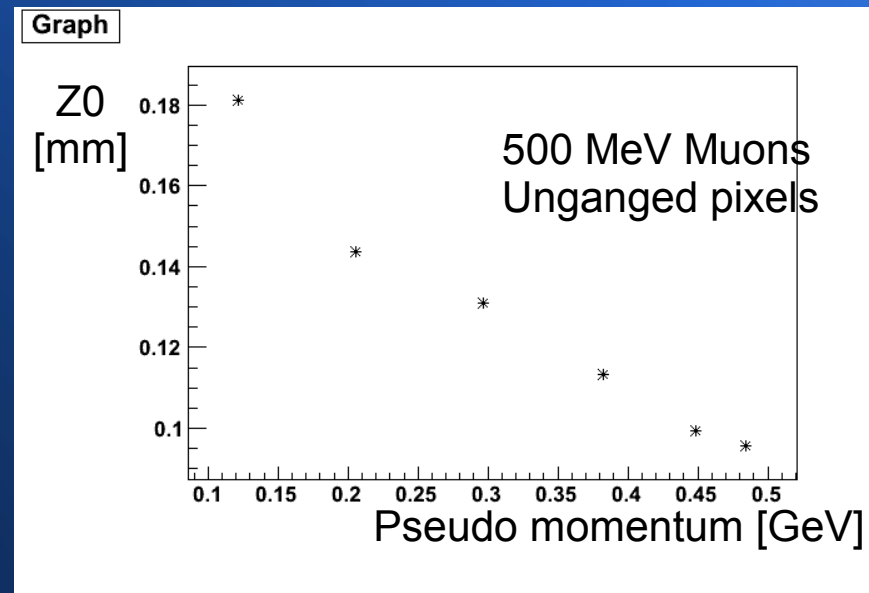
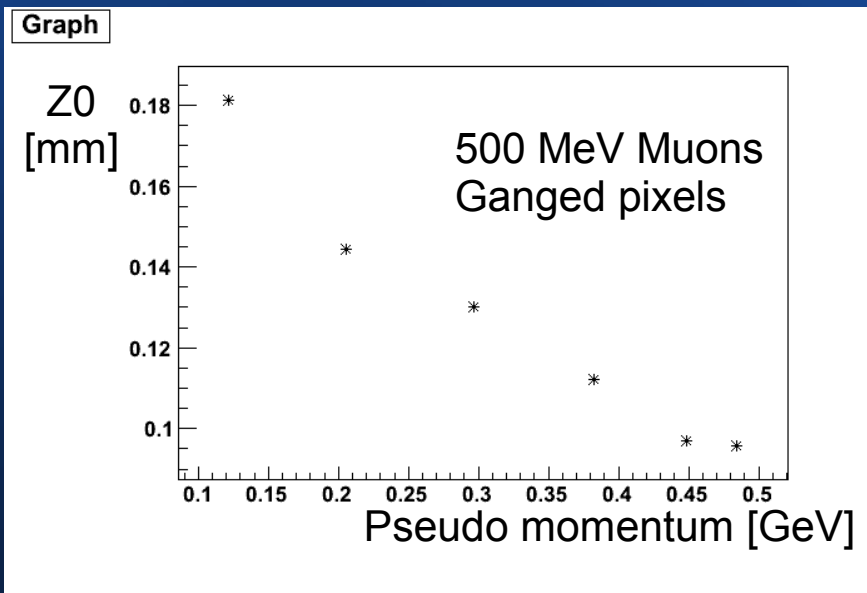
Results: Track Multiplicity

- PXD w/o ganged pixels + SVD: all in 5 – 6 % occupancy



Results: Z0 Impact Parameter Resolution

- PXD w/o ganged pixels + SVD: all in 5 – 6 % occupancy



Conclusions

- Tools for background studies implemented (MergeBackground processor)
- Tools for simulation of ganged pixels implemented (SiPxlDigi processor)
- Preliminary studies in high QED background performed, but too high occupancies
→ necessary to complete the study for 1%, resp. 2% QED background

Deposited Energy in PXD

- 75(μm) - 90deg, 90(μm) - 56deg, 105(μm) - 45deg, 120(μm) - 38deg ...

