Incoherent pairs background studies for the ILD vertex detector

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Characteristics of the study

- GuineaPig 0.7.4-b

  100 files of e^+e^- pairs

- Mokka-06-06
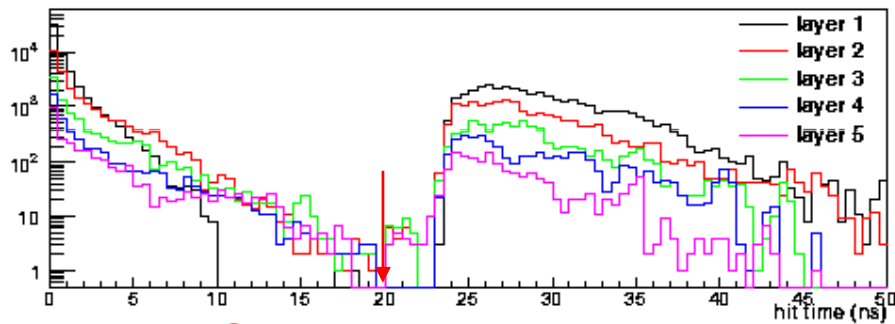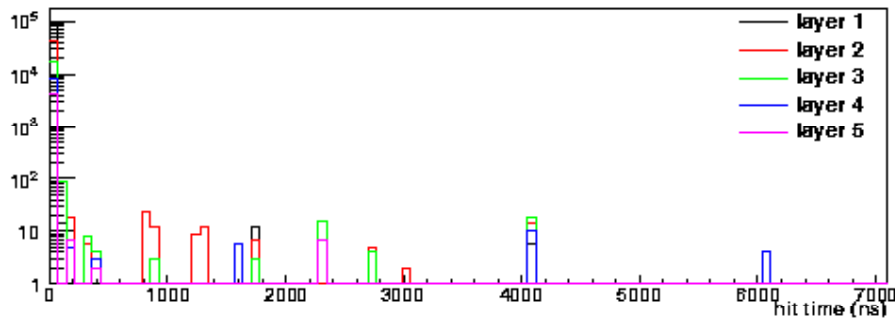
  detector model LDCPrime_02Sc_p01

  radii of VXD: 15, 26, 37, 48, 60 mm

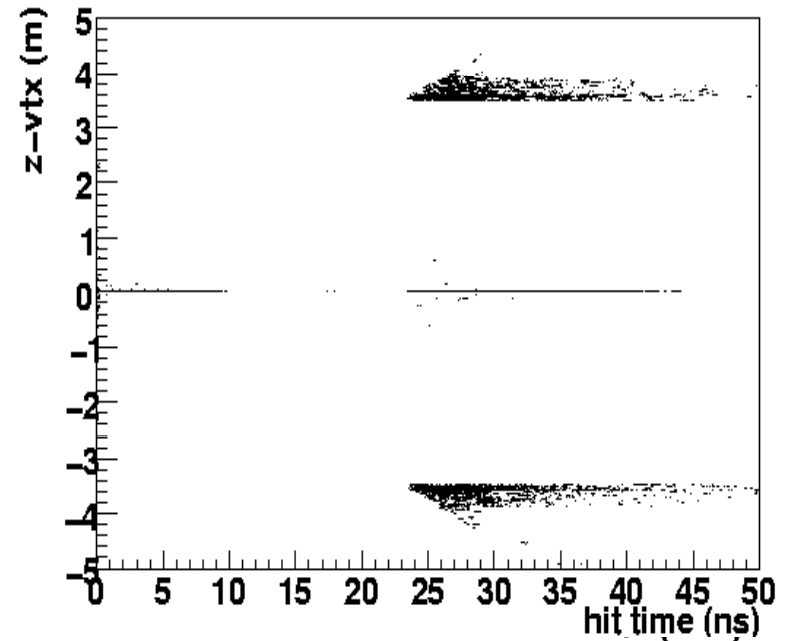 solenoid magnetic field 3.5 T

  VXD_side_band_electronic option 0

  LorentzTransformationAngle 7 mrad
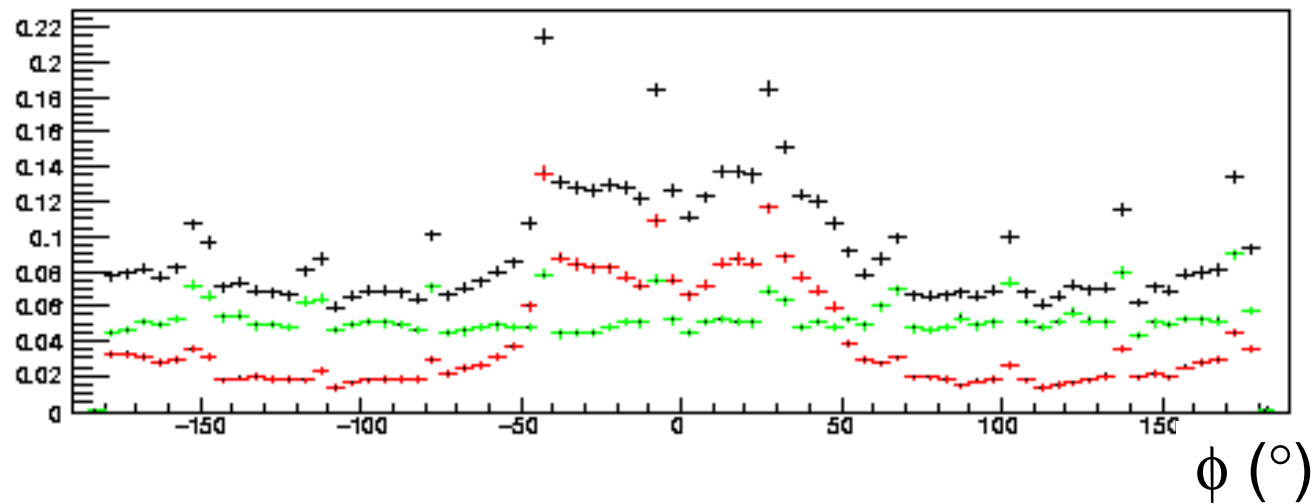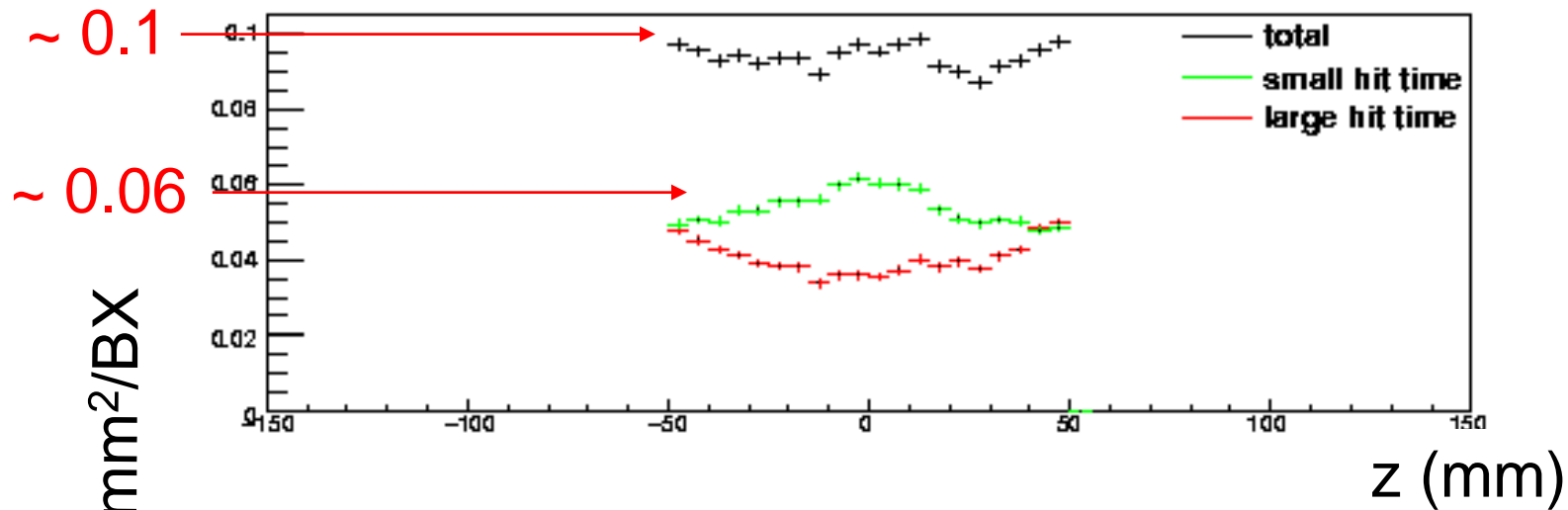
Hit time selection

The particle kinematics is different depending on their origin (if from the interaction point or not), thus they can be distinguished depending on their hit time.
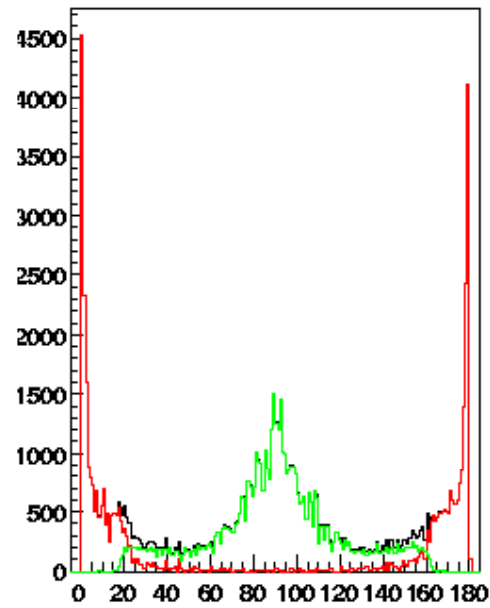

Cut at 20 ns

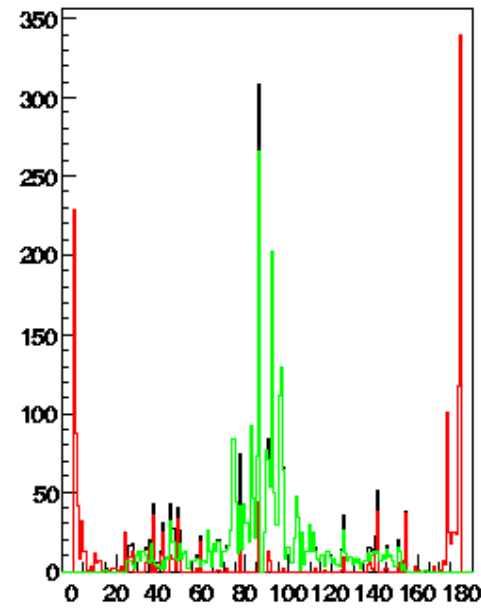# e⁺e⁻ pairs background on the first layer
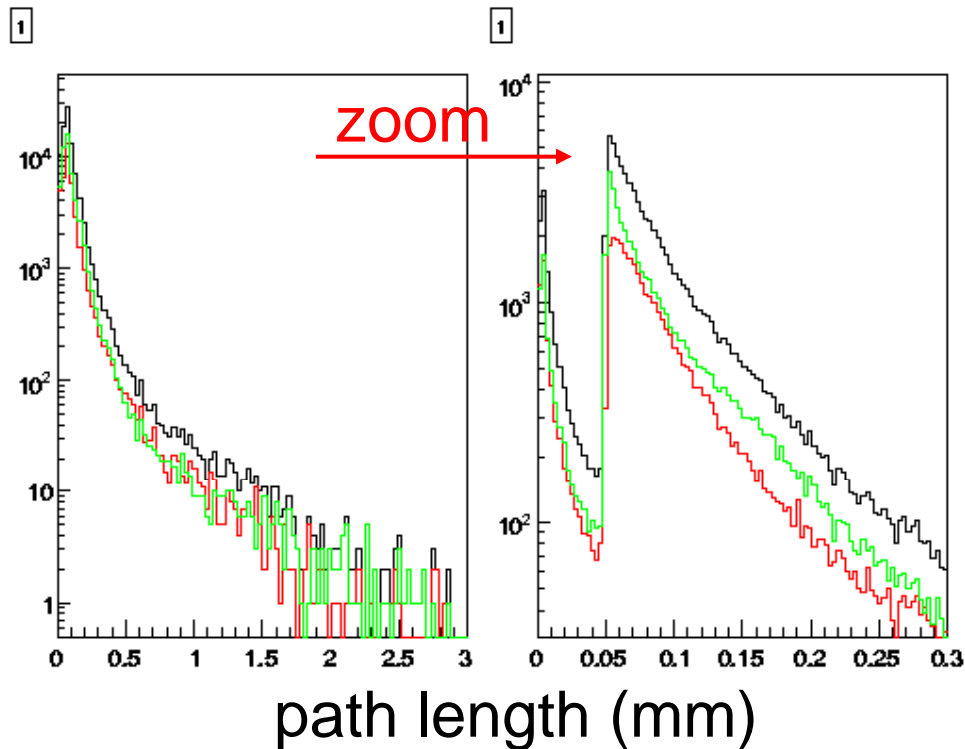
Angular dependence

Layer 1

Layer 5

Total
Small hit time
Large hit time

θ(°)

Path length on layer 1

zoom

path length (mm)

Total
Small hit time
Large hit time

Evaluated with the option *IcioDetailedTRKHitMode* in Mokka.

The entries for small path length are probably due to a wrong secondary particle assignment.

Estimation of the occupancy from path length

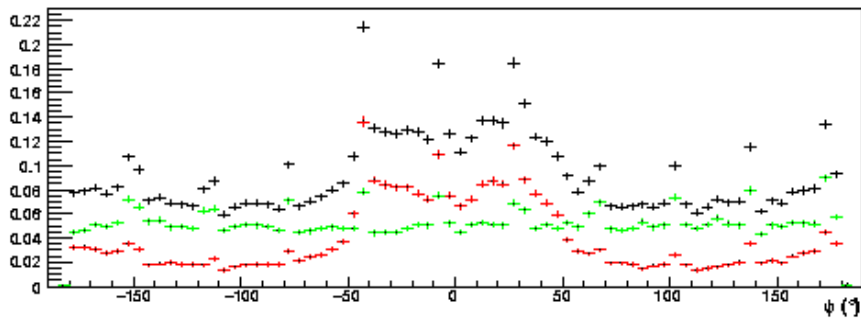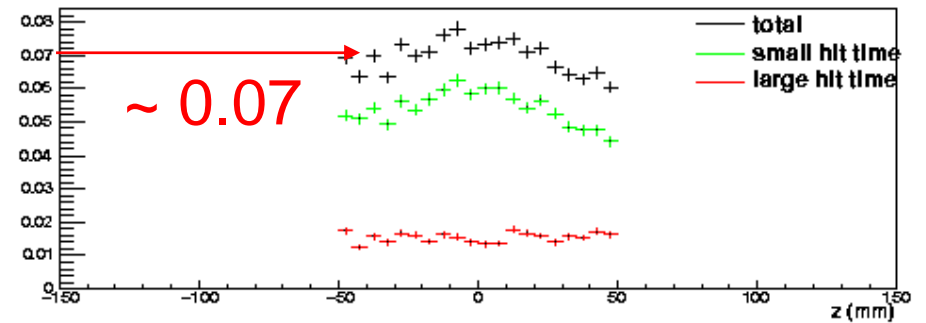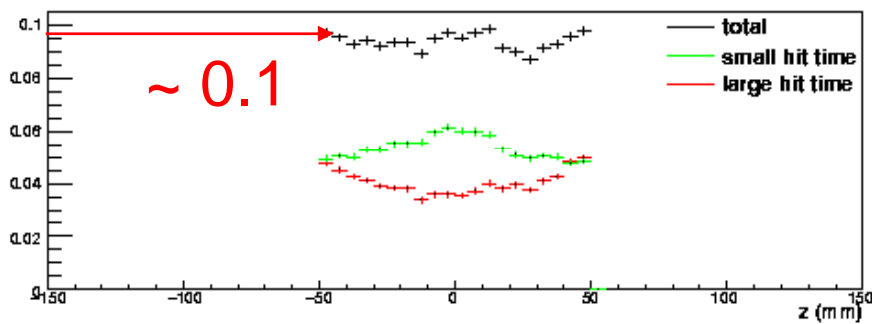**Standard parameters**
50 μm epi   3 pixel/straigth impact

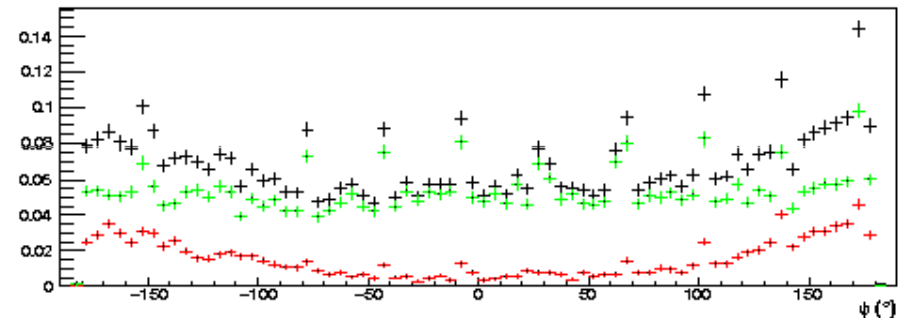**CMOS parameters**
15 μm epi   5 pixel/straigth impact

Layer	pitch (μm)	integration time(μs)	pitch (μm)	integration time(μs)
1	25	50	20	25
2	25	200	25	50
3	25	200	33	100
4	25	200	33	100
5	25	200	33	100

Layer	tot	small ht	large ht	tot	small ht	large ht
1	0.0790	0.0347	0.0443	0.0183	0.0080	0.0103
2	0.0381	0.0164	0.0217	0.0062	0.0026	0.0035
3	0.0105	0.0049	0.0056	0.0054	0.0025	0.0029
4	0.0041	0.0020	0.0021	0.0021	0.0010	0.0011
5	0.0016	0.0006	0.0010	0.0008	0.0003	0.0005

Effect of an anti-DID field

Conclusions

The occupancy on layer 1 can range from ~7% to ~2% depending on the technology Choice.

The presence of an anti-DID field reduces of ~30% the occupancy (large hit time component).