

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

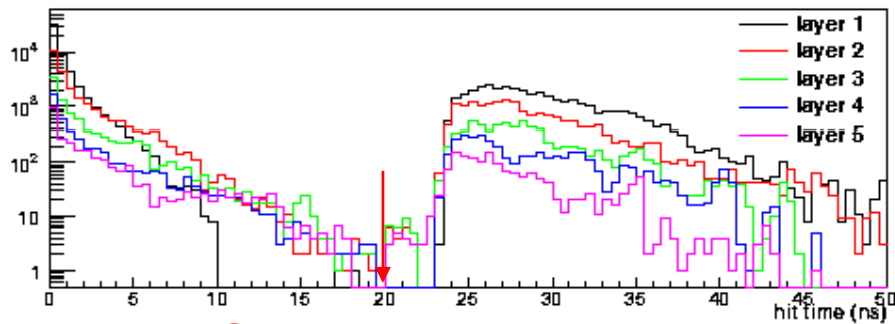
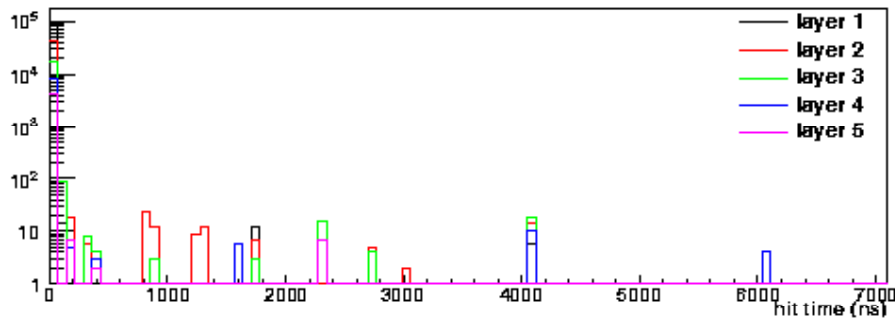
solenoid magnetic field 3.5 T

VXD_side_band_electronic option 0

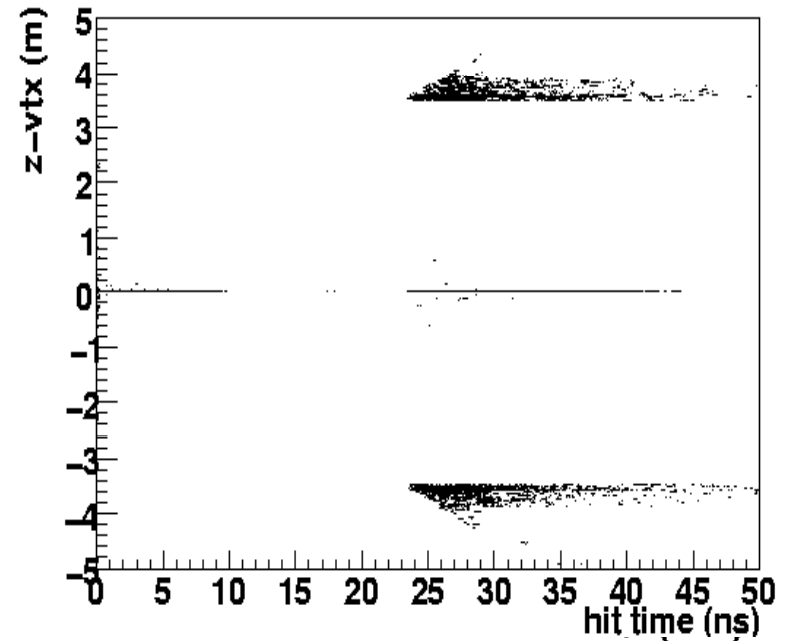
LorentzTransformationAngle 7 mrad

Hit time selection

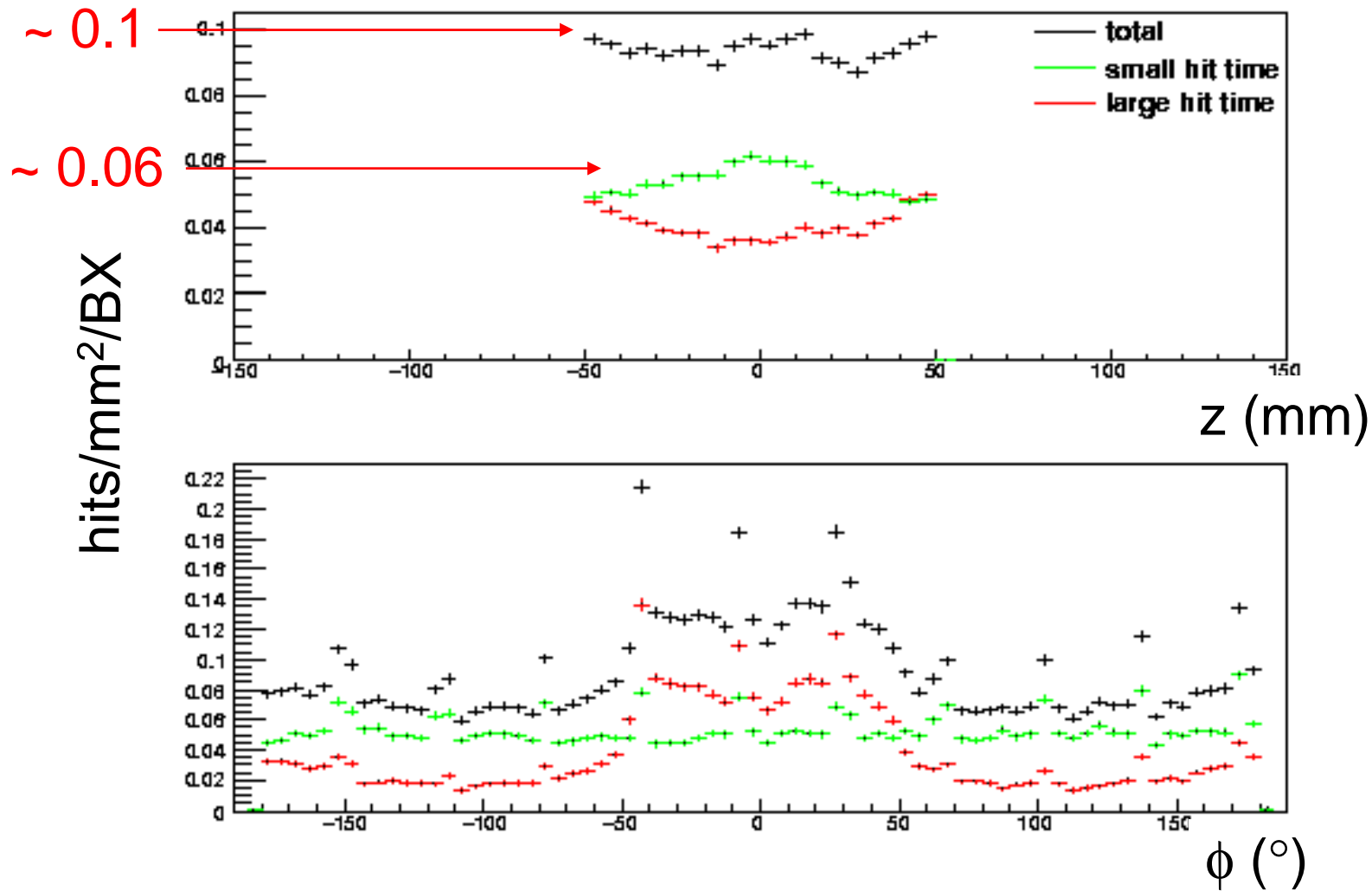
The particle kinematics is different depending on their origin (if from the interaction point or not), thus they can be distinguished depending on their hit time.



Cut at 20 ns

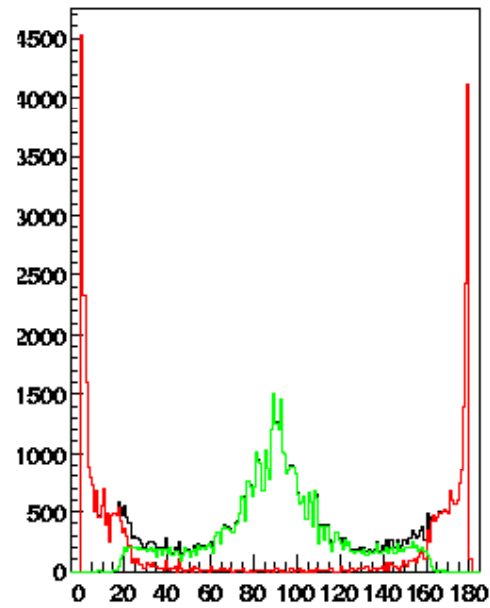


e^+e^- pairs background on the first layer

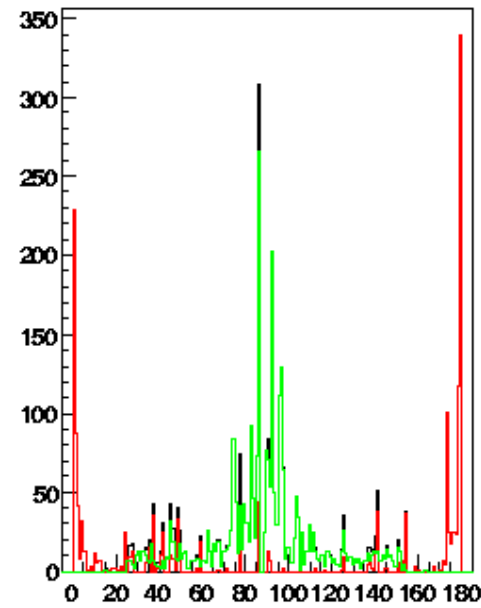


Angular dependence

Layer 1



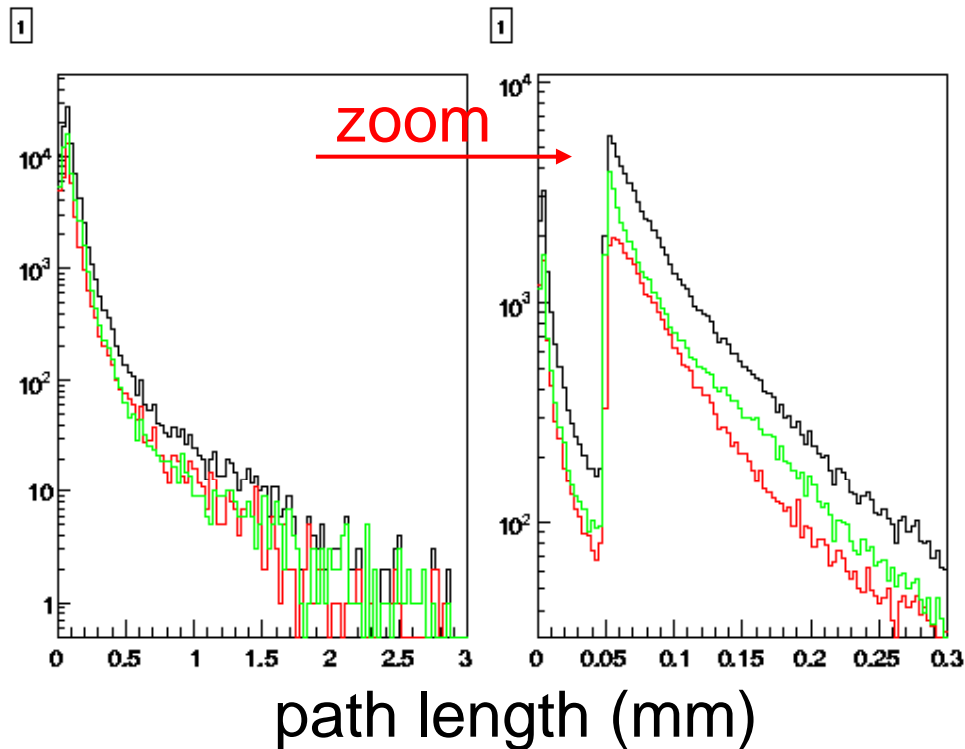
Layer 5



Total
Small hit time
Large hit time

$\theta(^{\circ})$

Path length on layer 1



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/straight impact

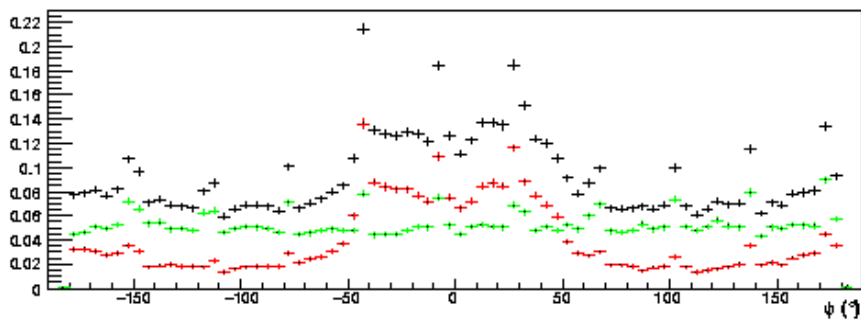
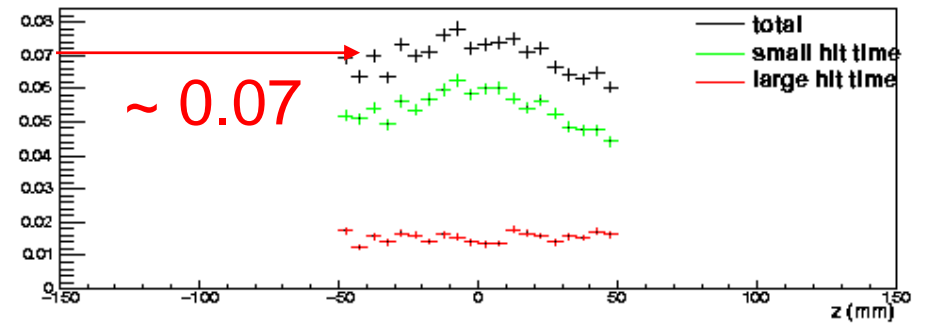
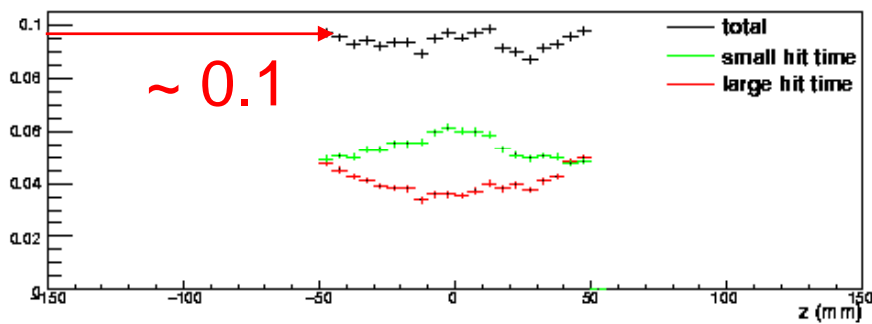
CMOS parameters

15 μm epi 5 pixel/straight impact

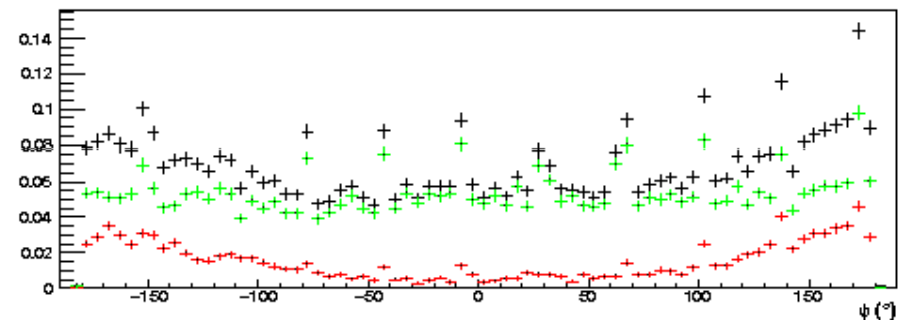
Layer	pitch (μm)	integration time(μs)	pitch (μm)	integration time(μs)
1	25	50	20	25
2	25	200	25	50
3	25	200	33	100
4	25	200	33	100
5	25	200	33	100

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



hits/mm²/BX



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).