

# Beam pair-background in with SB2009 and RDR from GuineaPig

Mikael Berggren<sup>1</sup>

<sup>1</sup>DESY, Hamburg

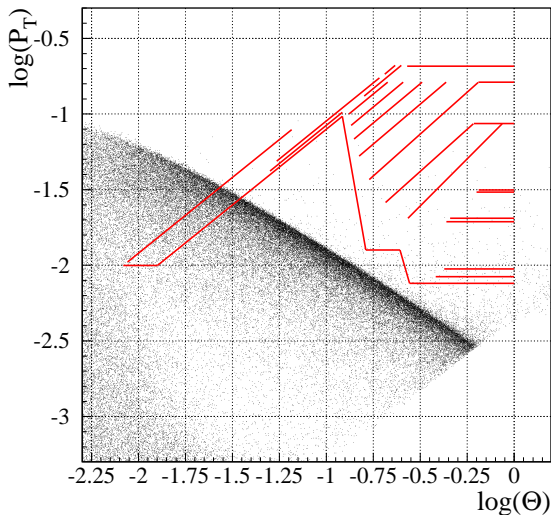
Brau group meeting, 15 Jan 2010

# Pairs simulation

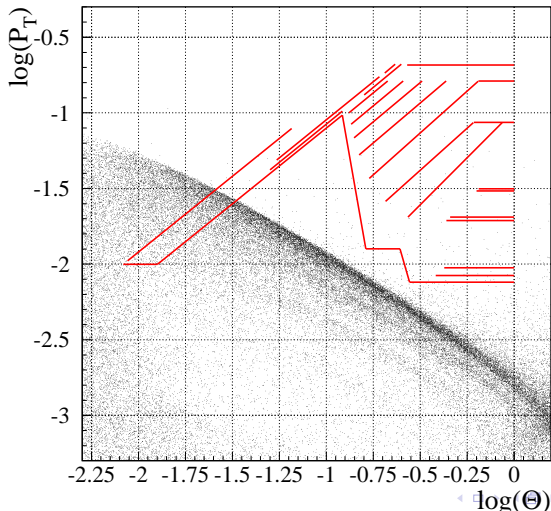
- Pairs generated by GuineaPig
- Beam-parameters:
  - SB2009 LowP with travelling focus. 213000/BX.
  - SB2009 LowP without travelling focus. 211000/BX.
  - RDR nominal. 124000/BX.
  - RDR LowP. 214000/BX.
  - Exact numbers might vary with GP settings !
- Full simulation for the tracking-aspects.
- For BeamCal: No detector simulation, just transport,
- but
  - With Anti-DID.
  - With crossing-angle.
  - (modulo errors in the algebra from my side ;))
  - Material in front of BeamCal is vacuum!

Work by A. Hartin, K. Winchmann, K. Yoshida, A. Miyamoto, O. Novgorodova, M. B. ...

## Pairs in tracker: SB2009-TF (no Xing angle, anti-DID)

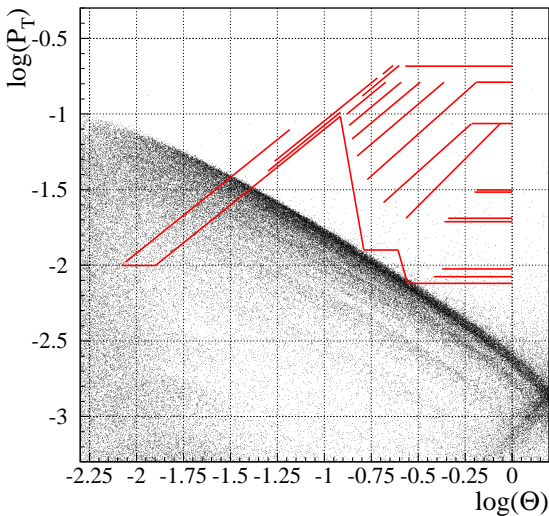


# Pairs in tracker: RDR nominal (no Xing angle, anti-DID)

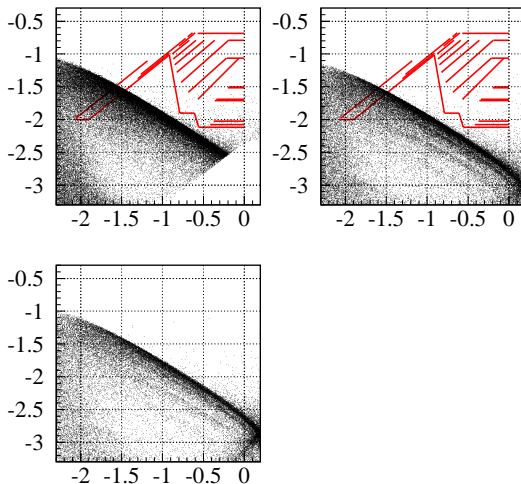




## Pairs in tracker: RDR LowP (no Xing angle, anti-DID)

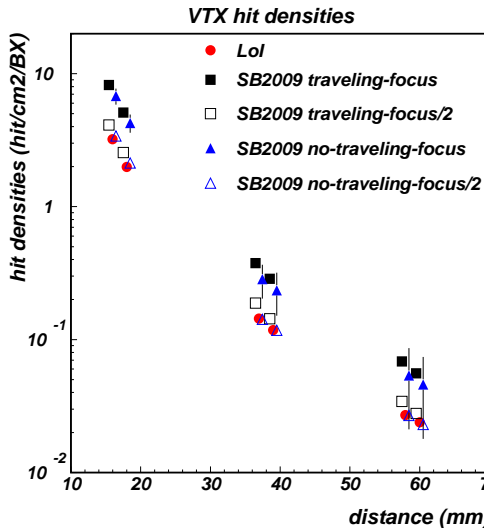


## All in one: SB2009-TF,RDR nom, RDR LowP



# Tracking: Hits in Vertex detector

- Full simulation (Mokka), with crossing-angle and anti-DID field.
- No reconstruction yet, just count hits.
- The ILD VTX integrates of a certain time-window  $\rightarrow$  **only half as many BX:es with lowP !**
- SB2009 no TF = RDR nom;  
SB2009 with TF =  $1.3 \times$  RDR nom.
- Some issues about the absolute numbers (GEANT4 settings) to be ironed out.  
Relative should be OK.



# Tracking: Hits in Vertex detector

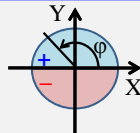
## $\phi$ distribution

$\phi$  distribution of hit was checked.

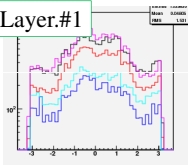
- Normalized to 1BX.
- Many background hits are at  $\phi=0$ .

SB2009wTF(GP)  
 SB2009wTF(cain)  
 Nominal(GP)  
 Nominal(cain)  
 LowP(GP)

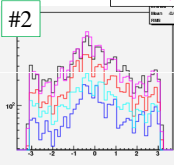
Definition of  $\phi$



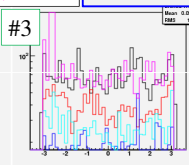
Layer.#1



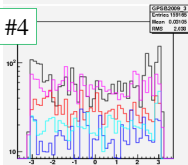
#2



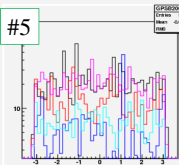
#3



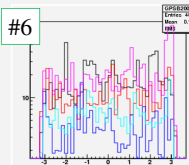
#4



#5



#6



## Tracking: Other detectors

## SB2009 TF and NTF

detector	LoI	SB09 Low P NTF	factor	SB09 Low P TF	factor
SIT (den.)	0.017+-0.010	0.039+-0.022	2.3	0.046+-0.016	2.7
	0.004+-0.0026	0.0088+-0.0030	2.2	0.013+-0.008	3.3
FTD (den.)	0.0127	0.0240	1.9	0.031	2.5
	0.0085	0.0170	2	0.021	2.5
	0.0017	0.0036	2.1	0.0045	2.6
	0.0018	0.0039	2.2	0.0050	2.8
	0.0014	0.0027	1.9	0.0036	2.6
	0.0008	0.0019	2.4	0.0026	3.2
	0.0007	0.0018	2.6	0.0025	3.6
HCAL (hits)	8419 +-649	19998+-374	2.4	25020+-621	3
ECAL (hits)	155.0	386.0	2.5	501	3.2
TPC (hits)	408.0	1026.0	2.5	1275	3.1
SET (hits)	5.6	13.4	2.4	15.5	2.8
	6.0	14.7	2.5	16.7	2.8

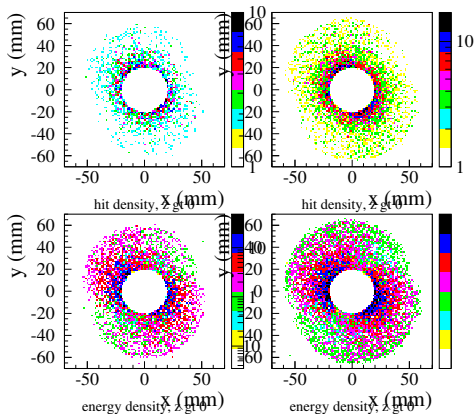
13.01.2010

VTX Hit Densities for Low P

3

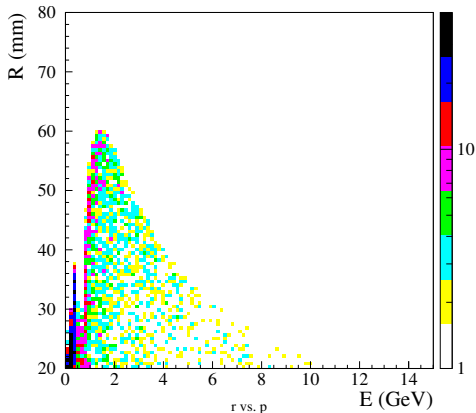
# BeamCal

- Only GP, but with crossing-angle and anti-DID.
- Both hit-densities (top) and energy-density (bottom) matters.
- The issue: can one still see a  $\approx 250$  GeV electron from a  $\gamma\gamma$  process over the pairs-background in SB2009TF (right, RDR nom left)?
- Radius vs. Energy.
- SB2009TF extends 5 mm further, and has more pairs and more energetic ones.



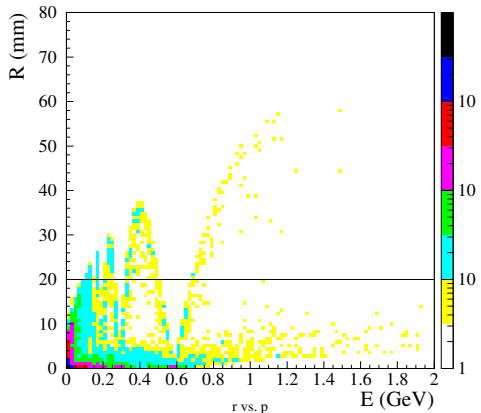
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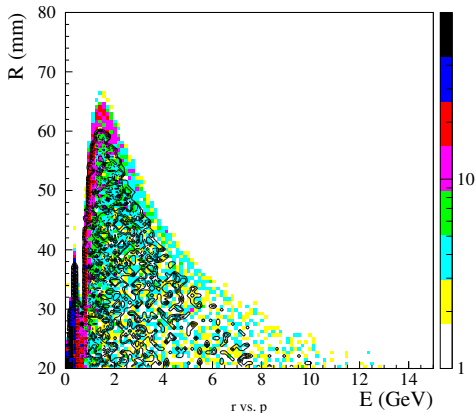
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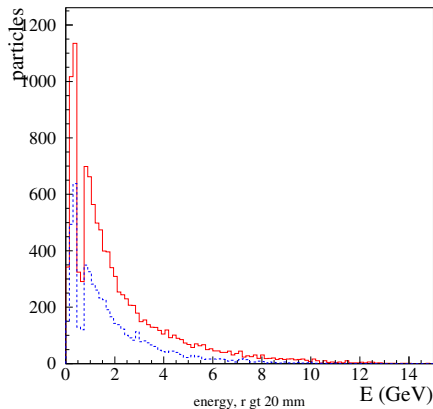
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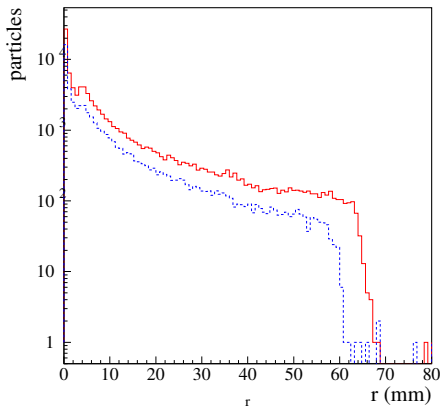
# BeamCal

- Distribution of particle energy for  $r > 20$  mm.
- Total energy in BeamCal per BX: 24 TeV for SB2009TF, 10 TeV for RDR nom.
- Number of particles per BX: 11500 for SB2009TF, 5400 for RDR nom.
- Energy density vs Radius: SB2009TF has about twice at any given radius, and extends 5 mm further.
- All the relevant numbers double



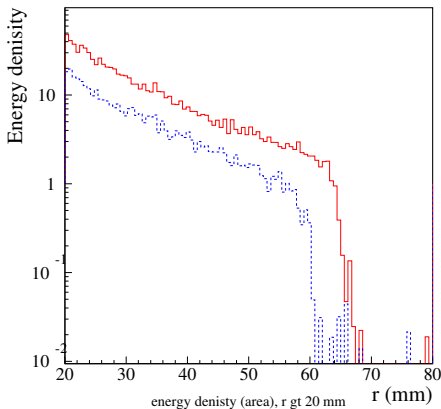
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Detailed full simulation is on-going @ DESY-Zeuthen. The implications for the fundamental question on electron-tagging by this doubling will therefore be clarified soon.

# Conclusions

- As far as the geometry of the cone is concerned, SB2009-TF  $\approx$  RDR-nom, but:
  - More pairs.
  - More energy.
- However, only half as many BX:es/time  $\rightarrow$  VTX sees very similar number of hits.
- TPC was already in the LOI shown to be able to cope with at least RDR  $\times$  10.
- Other single-BX read-out detectors have comfortably low levels. Possible exception: FTD.
- Twice as many pairs within almost the same radius in the BeamCal, and higher energies: Will tagging suffer ?
- Full simulation of BeamCal with SB2009 is going on.