Status of test beam simulation in Mokka

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Simulation of 2006 test beams

- Setup of 2006 test beams at Desy and CERN has been simulated in detail in Mokka
  - Latest version of Mokka is 06-03p02
- Different test beam models have been implemented
  - 'Old' coordinate system: origin of coordinate system on the back plane of the ECAL
    - Desy tb: model TBDesy0506
    - CERN Aug tb: model TBCern0806
    - CERN Oct tb: model TBCern1006
  - 'New' coordinate system: origin of coordinate system on the back plane of DC closer to ECAL (DC1)
    - Desy tb: model TBDesy0506_01
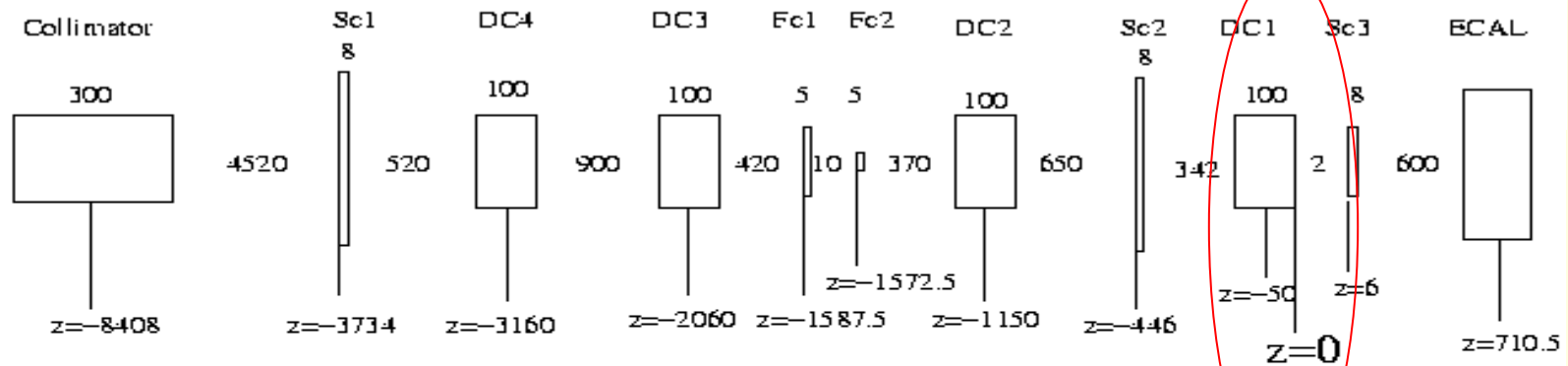   - CERN Aug tb: model TBCern0806_01
    - CERN Oct tb: model TBCern1006_01

Sketch of Desy models

TBDesy0506

TOP

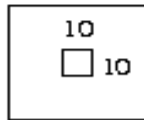| Collimator	Sc1	DC4	DC3	Fc1 Fc2	DC2	Sc2	DC1	Sc3	ECAL

Z=0
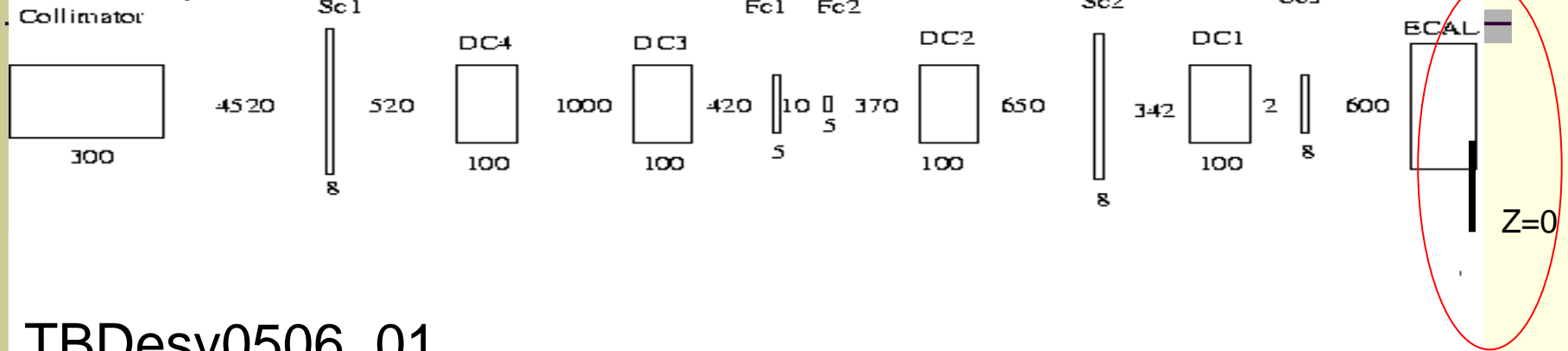
TBDesy0506_01
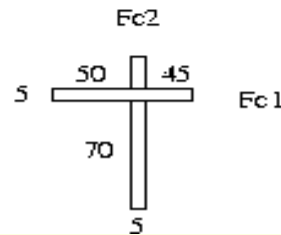
TOP – Desy May 2006
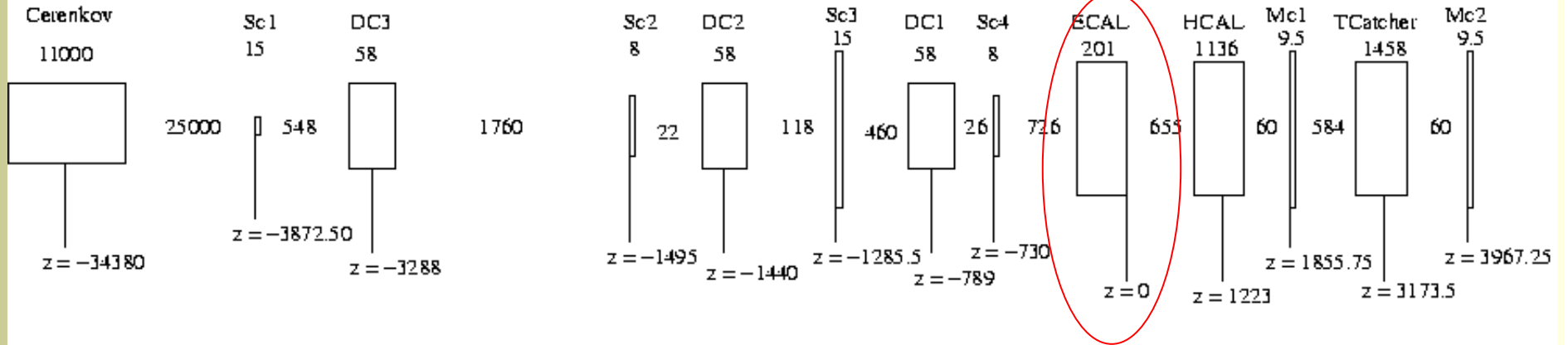

FRONT

Sc1 and Sc2 are 200x200
Sc3 is 120x120

All distances are in mm
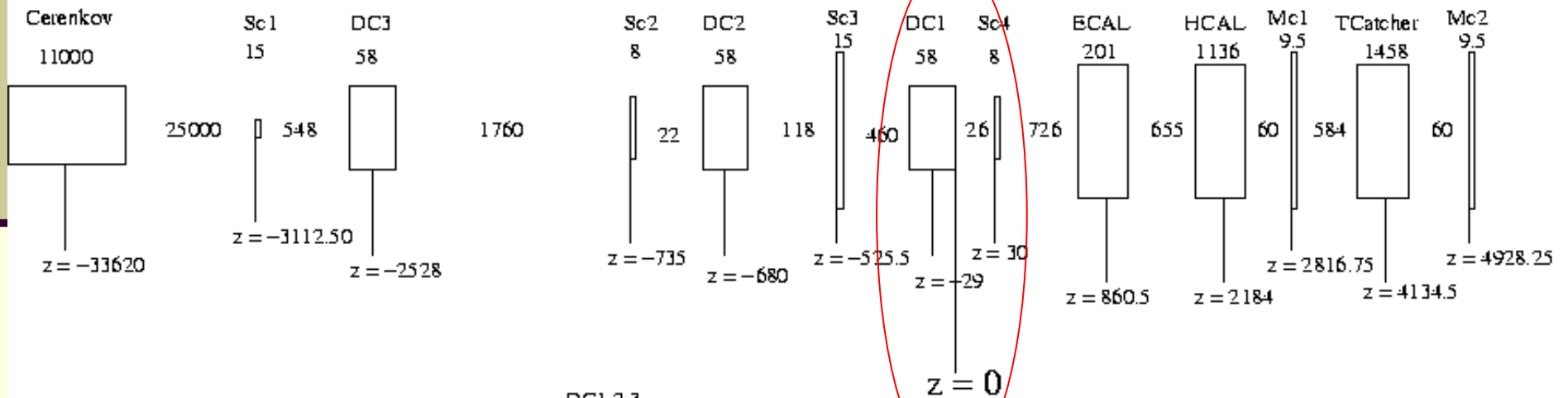
Sketch of CERN Aug models
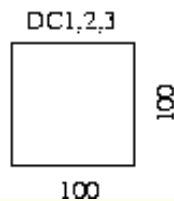

TBCern0806

TOP

TBCern0806_01

TOP – CERN August 2006

FRONT

Sc1 is 30x30
Sc2 and Sc4 are 100x100
Sc3 is 200x200

DC1,2,3

Mc1 and Mc2 are 1000x1000   All distances are in mm

'Old' coord. syst. Vs 'New' coord. syst.

■ In 'old' coordinate system the axes are tied to the ECAL, therefore when the ECAL is simulated at an angle θ wrt beam normal incidence, the ECAL is kept fixed and all beam detectors are rotated by $-\theta$ wrt the ECAL front face

    ■ Not intuitive !

■ In new coordinate system the axes are not tied to the ECAL, so rotation is done keeping fixed the beam detectors and rotating the ECAL only

    ■ See next slide !

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TBDesy0506_01 with ECAL @ 45°

Z=0

Config angle

Ecal SC3 DC1 SC2 DC2 FC1,2 DC3 DC4 SC1
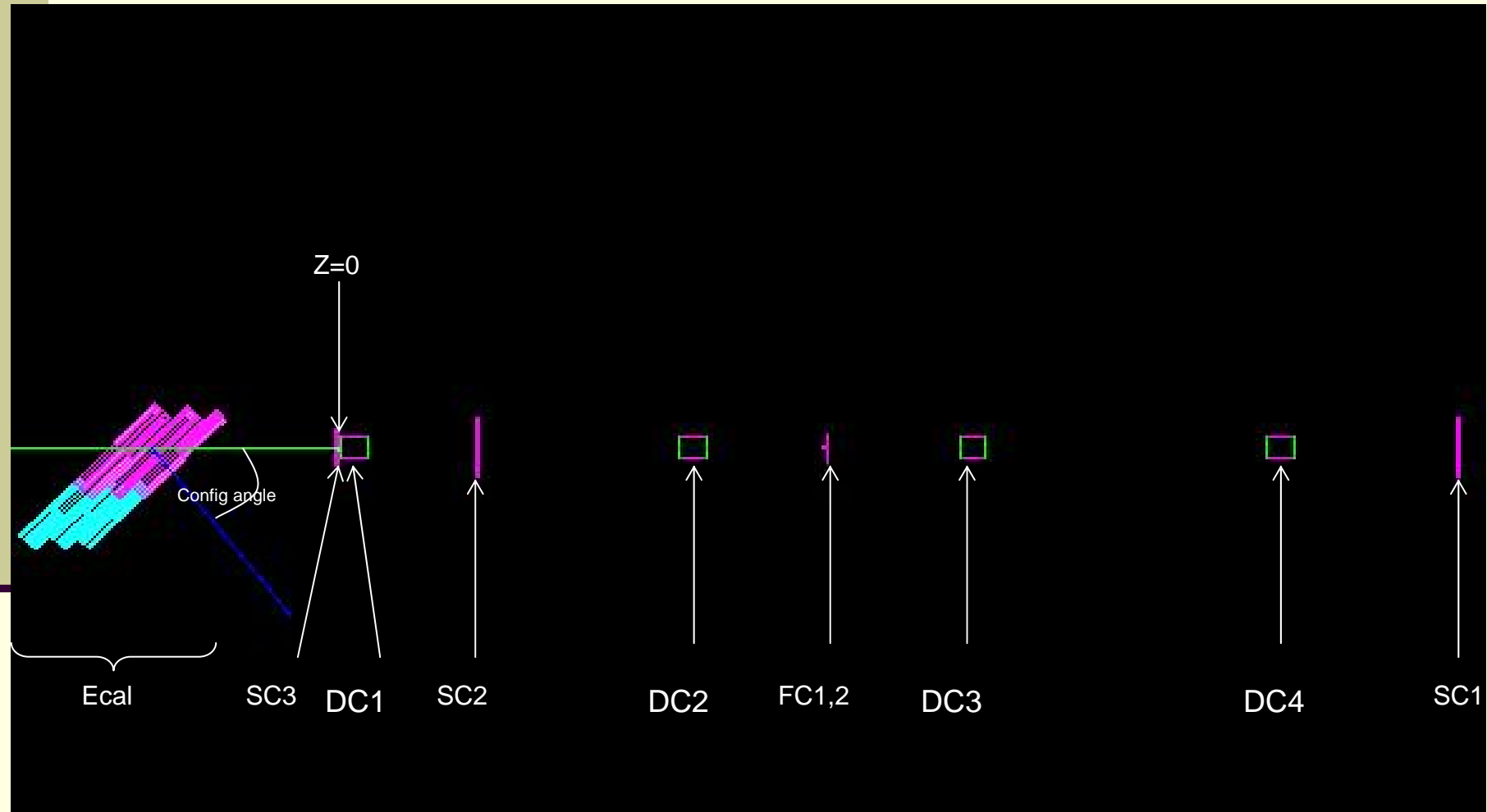
Improvements in simulation wrt Mokka 06-03p01

- Real drift chambers in the Desy setup give separate measurement of X and Y position on hits
  - Fist half of the chamber gives X position, second half gives Y position
- As chambers are simulated in Mokka v06-03p01, each hit has an X and Y position
  - Re-write driver to match real chambers as much as possible

- At the digitization stage, we would like to use drivers that are independent of the setup (Desy or CERN)
  - Need to write one single collection of hits instead of one collection per chamber

New DCH driver for Desy0506 model

- **New DCH driver** has been tested
  - Each chamber is built assuming two different gas volumes (one for X and one for Y)
  - Hits in each gas volume are simulated as TRKHit (==SimTrackerHit in LCIO)
    - (x,y,z) postion of hit is generated
    - Digi code will have to consider the appropriate coordinate (x or y) depending on the layer
  - Total of 8 layers (2Xchambers)
  - New test beam model implemented in the DB
    - TBDesy0506_dchxy_new

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New chamber layout

- **Two separate volumes**

- **One single hit collection**
    - TBdchXY02_dchSDxy0
    - Use cellID to distinguish hits from each layer:
        - DC1 -> layer 0 (X), 1 (Y)
        - DC2 -> layer 2 (X), 3 (Y)
        - DC3 -> layer 4 (X), 5 (Y)
        - DC4 -> layer 6 (X), 7 (Y)

viewer-2 (OpenGLImmediateX)
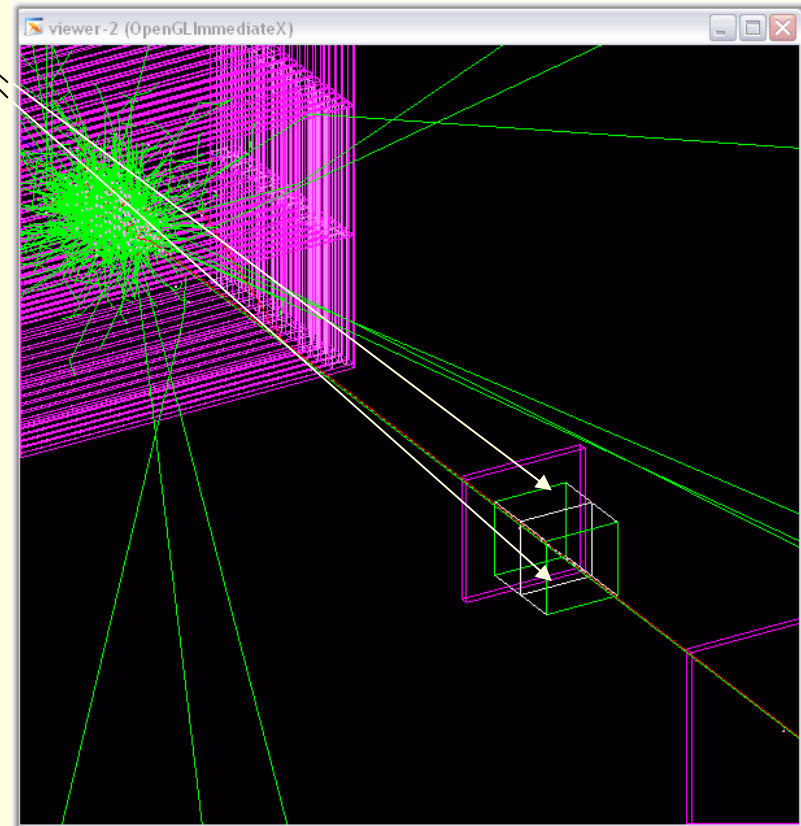
Conclusions

- **Models for detailed simulations** of the 2006 test beam setup are available
- **Several models** are implemented in latest version of Mokka (06-03p02)
  - 'Old' coordinate system
    - TBDesy0506, TBcern0806, TBCern1006
  - 'New' coordinate system
    - TBDesy0506_01, TBCern0806_01, TBDesy1006_01
  - New DCH layout, with one collection of hits
    - TBDesy0506_dchxy_new
  - Looking into more possible improvements
    - Simulation of steel frame around scintillators (Desy/CERN)
    - Improvement in simulation of CERN DCHs
- All info on detector models can be found on the Mokka WEB page:
  - http://polywww.in2p3.fr:8081/MOKKA/detector-models/test-beams/test-beams/