A Pixel Telescope for EUDET

and for everybody else!

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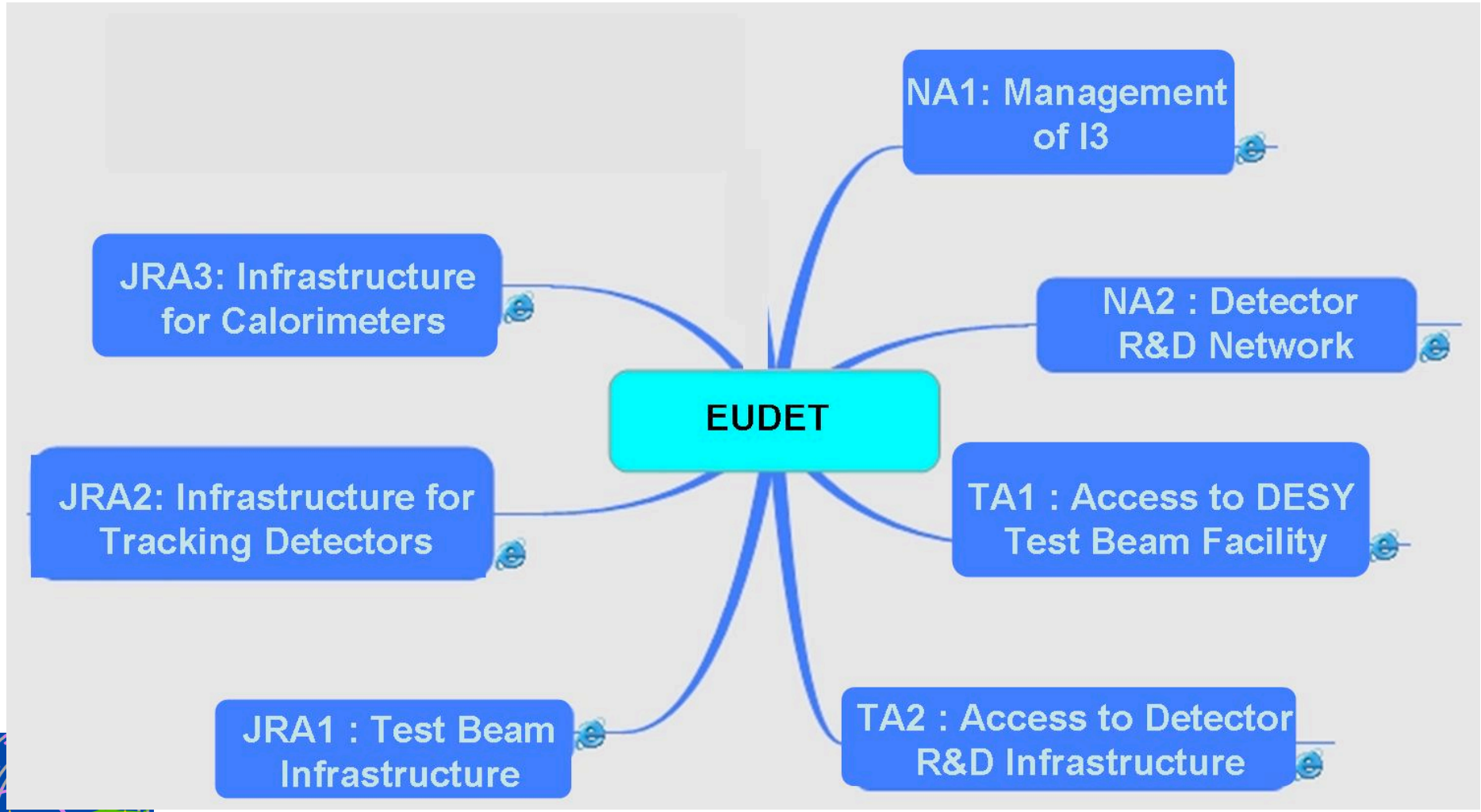
Outline

- EUDET
- JRA1
- The Pixel-Telescope
- When/Who/Why to use it?
- Outlook/Conclusions

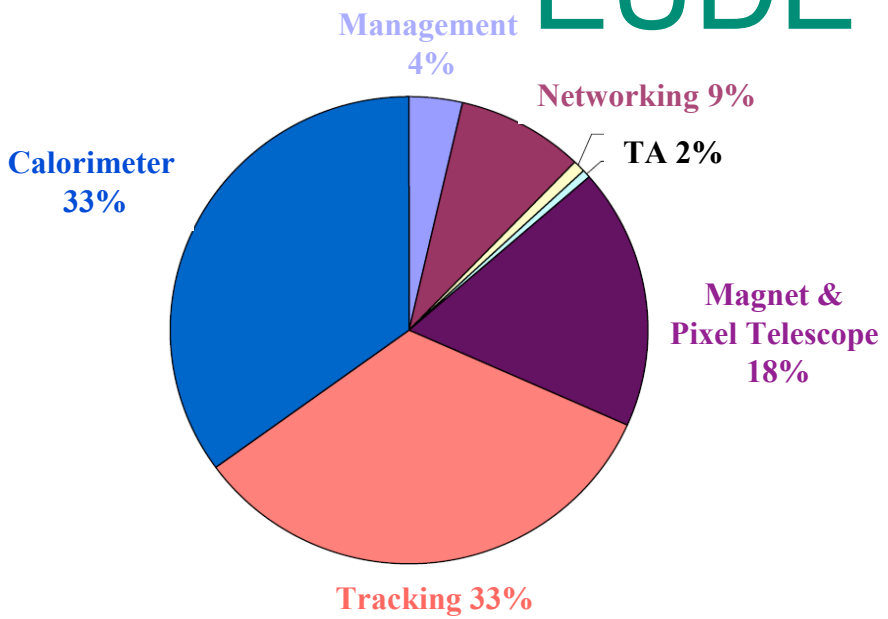
EUDET Overview

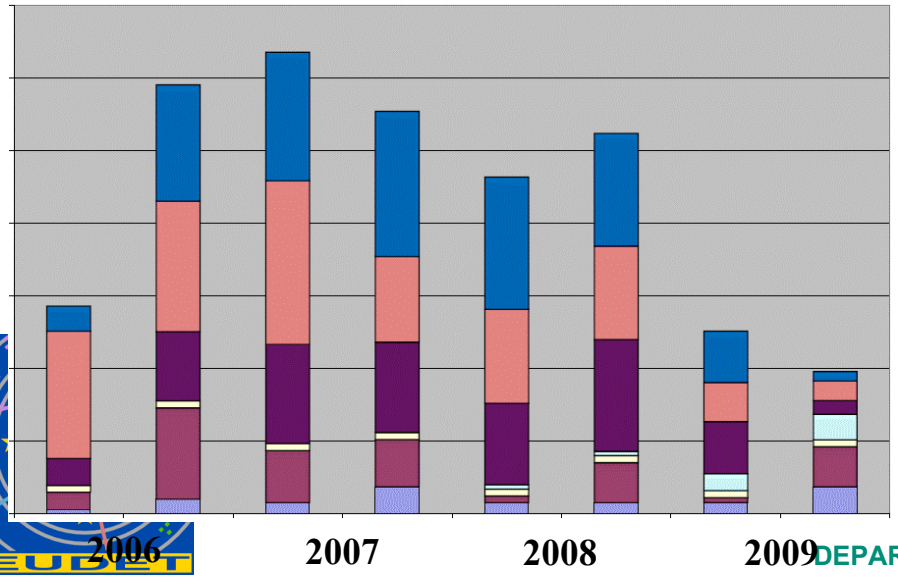
- Goal: Create infrastructure to support R&D for International Linear Collider
- 6th framework program of EU (21 M€, 7 M€ from EU)
- Timeline 2006-2009 (Kickoff @DESY Feb'06)
- 31 european partner institutes, 20 associates

EUDET Activities



EUDET Budget



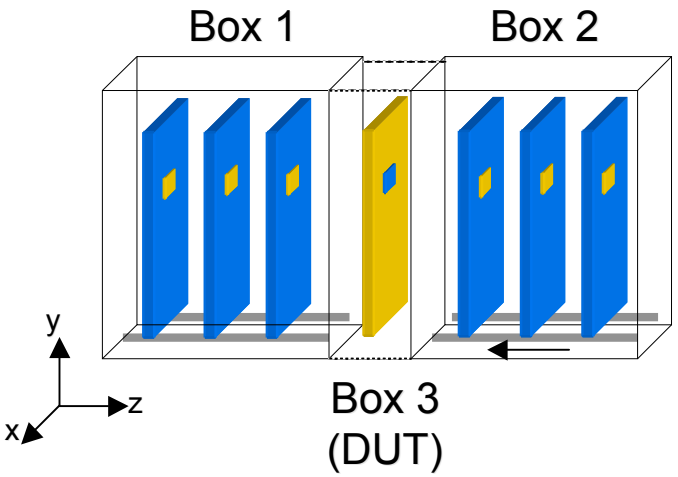


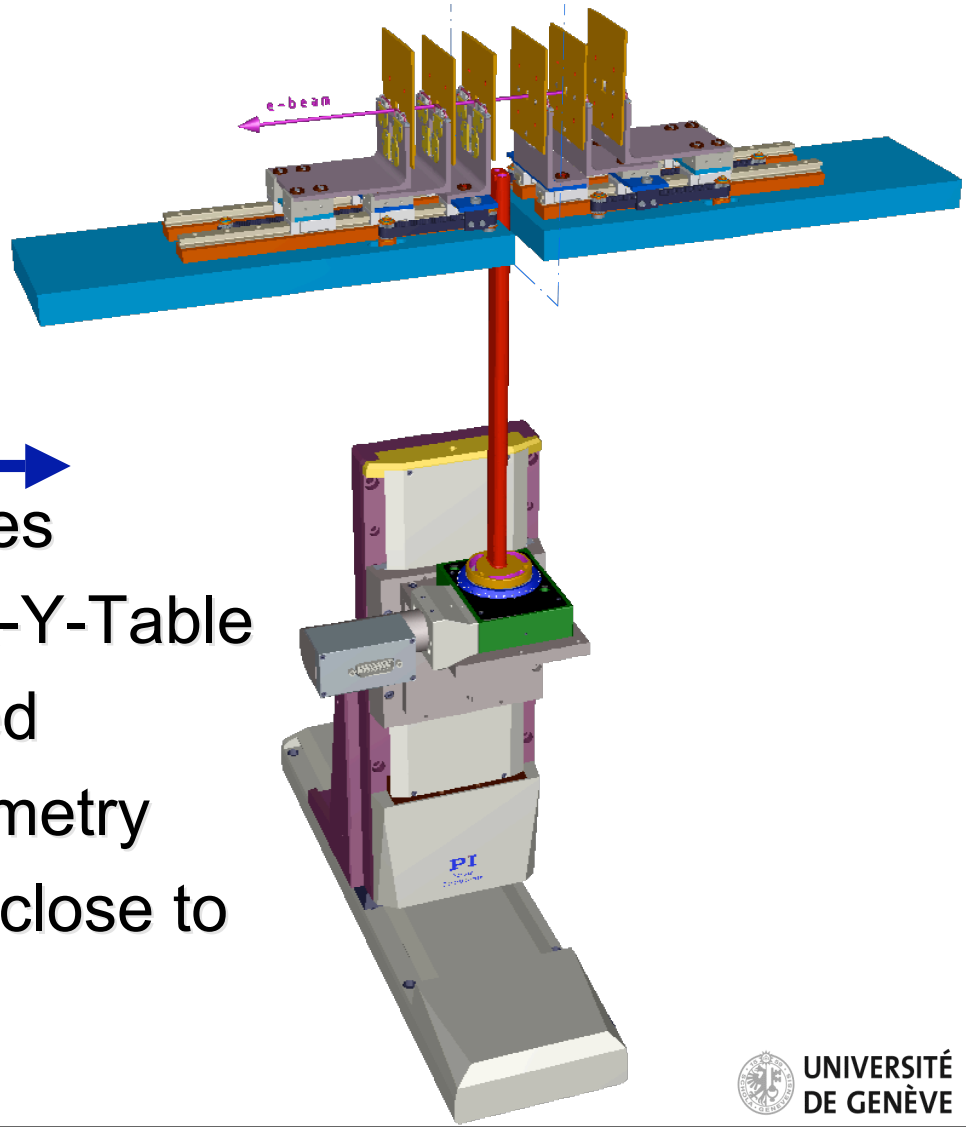
- most of the resources for the development of the infrastructures
- ramp-up first half 2006
- full swing activities for 2.5 years
- last year: phase-out and exploitation of infrastructures

JRA1 - Testbeam Infrastructure

- Large bore magnet:
  - ≈ 1 Tesla, Ø ≈ 85 cm, stand-alone He cooling, supplied by KEK
  - infrastructure (control, field mapping, etc.) through EUDET
- Pixel beam telescope
  - 4-6 layers of MAPS detectors
  - CCD and DEPFET pixel detectors for validation, maybe TPC
  - easy-to-use DAQ system incl. Trigger Logic Unit
- Note: all EUDET infrastructure is movable
  - construction & initial tests at DESY
  - later exploitation at CERN, FNAL etc. possible

Pixel Telescope

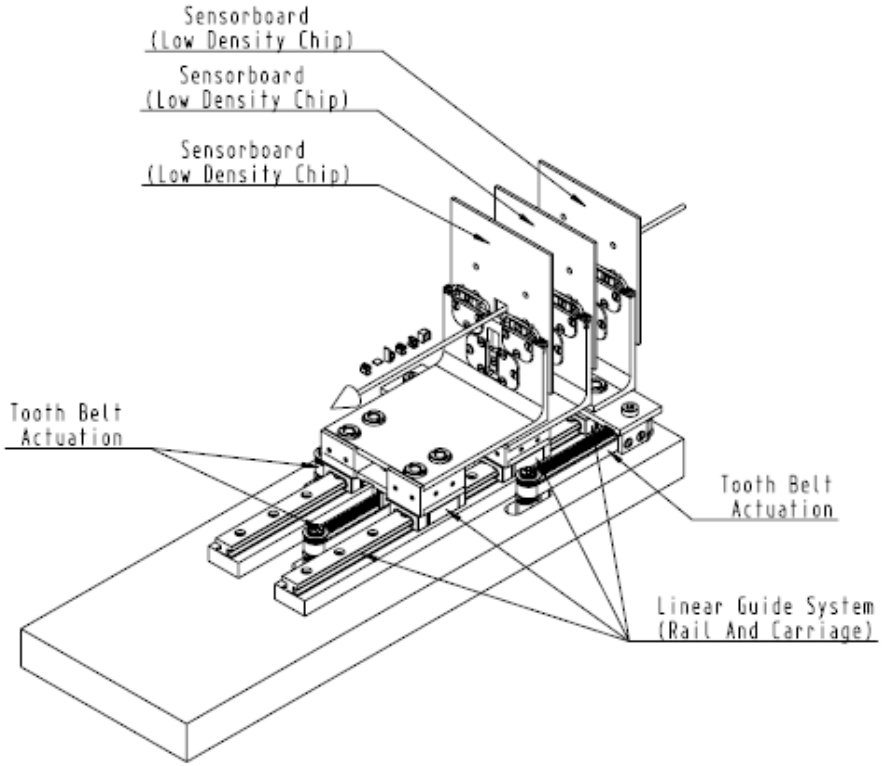




- Up to 6 telescope planes
- DUT is moveable via X-Y-Table
- Cooling can be provided
- Flexible telescope geometry
- High resolution planes close to DUT possible

Carsten Muhl (DESY)

Sensor Boxes

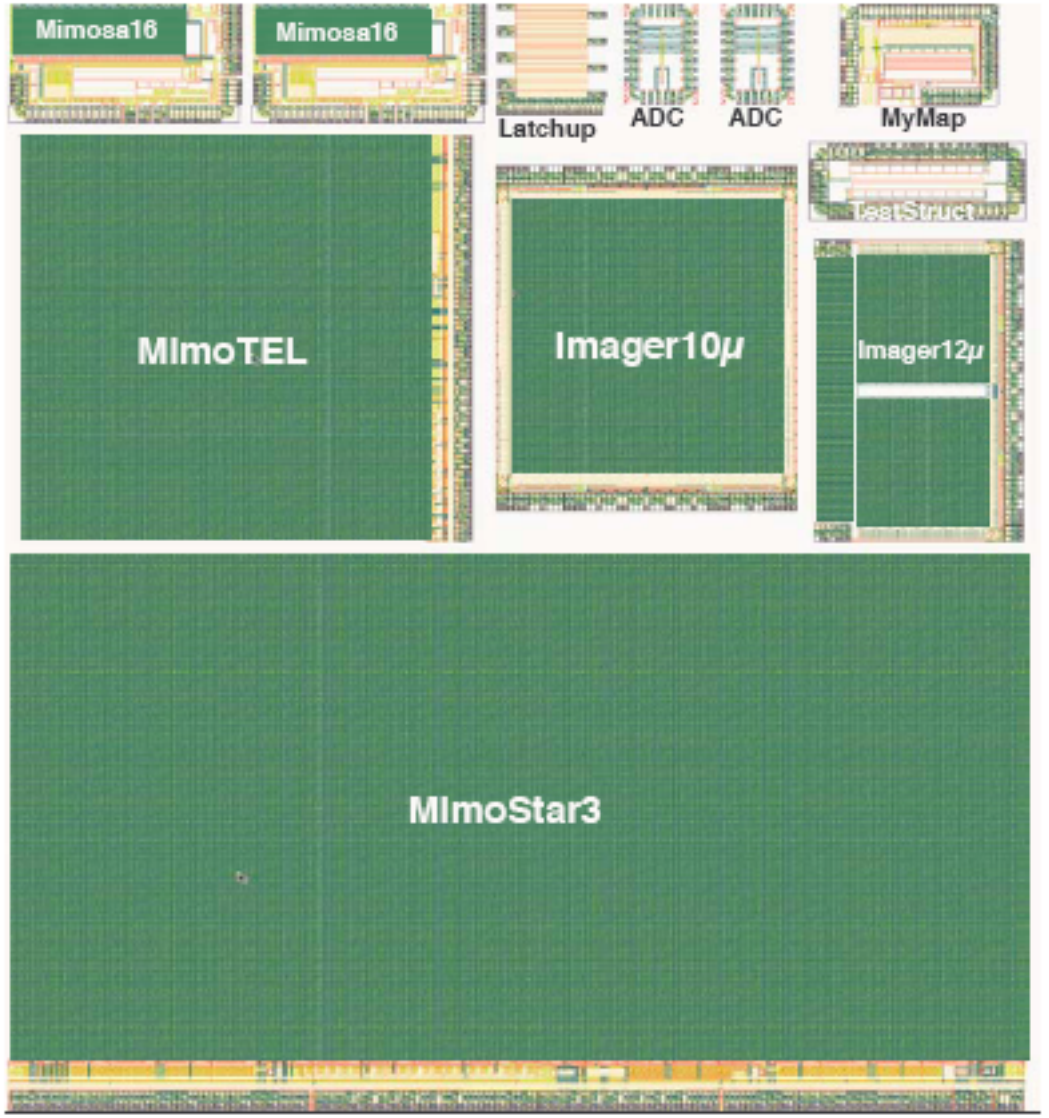


Sensor Box Content

- 3 planes on one main structure
  - Each has different geometry depending on position
  - Each plane movable individually with small tool
- Minimal distance between planes: 7mm
- Maximum lever arm: 200 mm
- Material: aluminum
  - All material non-magnetic
  - Materials were optimised for minimal thermal stress

Initial Sensor

- MAPS technology:
  - Baseline Sensor: MIMOTEL 256x256, 30 μm pitch, 7.6x7.6 mm²
  - HR tracker 512x512, 10 μm pitch, 5x5 mm²



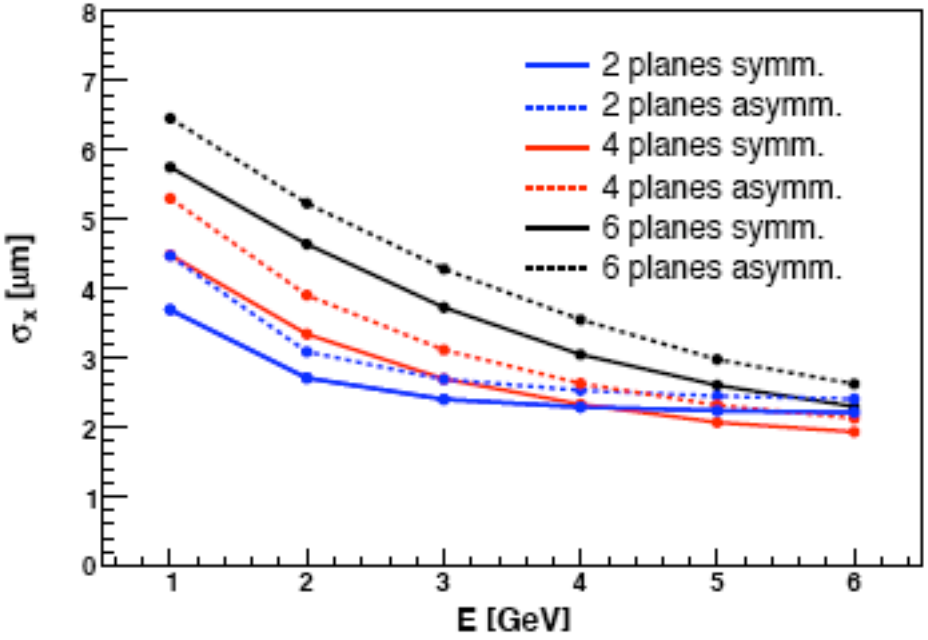
Final Sensor (end 2008)

- extension of Mimosa 22+
  - integrated zero suppression
  - column // readout
  - 1088 columns of 576 pixels (20.0x10.5 mm^2)
  - Readout time ~ 100 μs
  - thinned sensor
- High rates and low data volume possible
- Full exploitation in 2009 for users possible

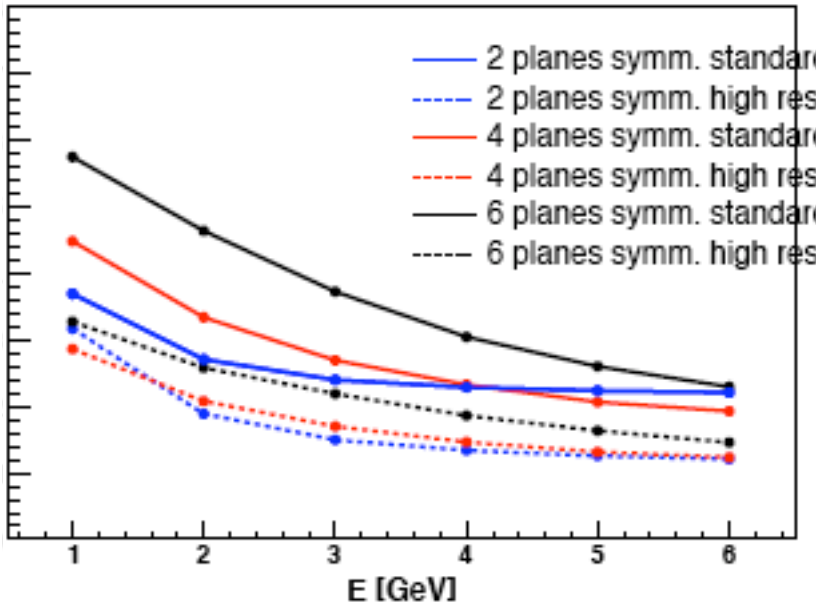
Performance

- Standard setup gives ~2 μm resolution
- HRT can go as low as ~1 μm
- Low energy dominated by multiple scattering

Mimotel



Mimotel + HRT



The 'Demonstrator'

- Only 3 sensor planes
- Mimotel sensors (256x256, 7.6x7.6 mm)
- Testbeam next week (@DESY), to:
  - qualify the concept
  - test the DAQ
  - measure sensor performance
- Further testbeams in August (@DESY) and October (@CERN, with DUT) to improve the system

When/Who/Why to use the Pixel-Telescope?

- When: Final telescope by end of 2008
- Full exploitation for users in 2009 (and after?)
  - Come and ask for it!
- Demonstrator available NOW:
  - 1st users in October (DEPFET, maybe CCDs)
- Who: Small sized detectors (Vertex, but also TPC-Prototypes etc), rates up to 1 kHz
- Why: It saves you manpower and we will provide support

How to integrate your DUT

- 3 possibilities:
  - Trigger/Busy/Reset and your own DAQ
    - you can do what you want
    - you can do what you want
  - integrated in our own DAQ (Example Code available), LCIO output
    - easy-to-use, LCIO for analysis
    - may need to adapt your analysis framework
  - fully integrated at Hardwarelevel, our frontend board can accommodate other technologies via piggyback extensions
    - clocking out of TLU event number comes for free
    - not adopted for all DUTs

Conclusions

- EUDET Pixel telescope to qualify detector technologies for Vertex detectors (and others)
- High resolution and reasonable readout frequencies for most R&D
- Demonstrator available NOW s
- DUT integration at any level possible
- Final telescope end of 2008
- Free choice of the beam, system is portable
- External users can apply for travel money via EUDET

Come and Use it!