Introduction to the EUTelescope Workshop.

Ingrid-Maria Gregor, DESY

Scotty, beam me up!
DESY II

- synchrotron for electrons and positrons
- since 1987 used as pre-accelerator for
  - DORIS (until 2012)
  - PETRA
  - HERA (until 2007)
- for PETRA 3
  - single bunches with $1 \times 10^9$ positrons at 6.0 GeV every minute (Top-Up mode)
- test beam runs in PETRA 3 mode with extraction on the falling slope
  - extraction at 6 GeV
  - reduced beam current during Top-Up (10%)
- Top-Up mode allows 24/7 running of DESY II
  - test beam usage possible at any time
Test Beam at DESYII

- For test beam no extraction is used
- Inserting a carbon fibre in the circulating electron/positron beam -> Bremsstrahlung.
- Bremsstrahlung photons are converted to electron/positron pairs with a metal plate.
- Beam is spread out into a horizontal fan with a dipole magnet. Collimator cuts out final beam.
- No beam optics, very simple to use

With this concept DESYII provides three test beam lines with 1-5 GeV/c electrons.
- Test beam was developed during HERA detector preparation and used by all HERA experiments
- Recent years -> newly increase in usage due to LC and HL-LHC detector R&D
- From DESY side: would like to provide useful infrastructure for community

DESY II:
revolution frequency: 1 MHz,
RF frequency: 500 MHz
bunch length: ~30 ps.
average radius: 46.6 m
The carbon fibre has a thickness of 6-10 µm.

Six fibres are prepared inside the fibre holder. By rotation of the inner part, a broken fibre can be replaced without opening the machine vacuum.

Carbon fibre rotation system will be modernized this year.
Conversion Target (Secondary Target)

There are different conversion targets available:
- Al, Cu,

The selection of the conversion target is under control of the test beam user.

System will be modernized ...
**Infrastructure**

- All three test beam lines have
  - Interlock systems
  - Magnet control to select momentum
  - Patch panels with pre-installed cables (HV, RJ45)
  - Gas warning systems
  - Fast internet connection (DHCP)
  - Trigger scintillators
  - 7 degrees cooling water (soon)

- The users can ask for:
  - Translation stages (four at CERN)
  - Premixed gases
  - Superconducting Magnet (1T)
  - Beam Telescopes

- The users typically bring:
  - Data Acquisition incl. computers
  - Trigger scintillators
What is a beam telescope?
- A tool to define the exact track of a particle in a test beam very precisely.
- Used for detailed studies of newly developed detectors.
- Pointing resolution should be better than the expected intrinsic resolution of the device under test (DUT).

Generally applicable:
- DUTs: from small pixel sensors to larger detectors
- Movement of device under test (DUT) to scan larger surface
- Large range of conditions: cooling, positioning, (B-Field)
- Easy to use: well defined/described interface
- Very high precision: <3 µm precision even at smaller energies (DESY)
- Mobile!

… plan when we started out with the EUDET telescope in 2006 ….
Telescope Ingredients

- Sensors
- Readout Boards
- EUDAQ
- Trigger Logic Unit
- Mechanics

Sensor Boxes

Trigger Scintillators

DUT

Mechanics to position the sensors

Readout VME CPU

GBit ETH

LVDS

USB

ETH

EUDAQ PC

Secondary PC

or NI express

Trigger Logic Unit

Ingrid-Maria Gregor | Evolution ATLAS and CMS Tracker | February 28, 2013 | Slide 8
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**Important**

- Use of DAQ software and analysis software which is also general applicable and easy to use
- EUDAQ -> highly modular multi threaded software to implement existing DAQ “easily”
- EUTelescope -> Generic Pixel Telescope Data Analysis Software based on ILCSoft
- developed for our telescope but much more versatile
Telescopes !!

- More successful than anticipated
- Ended up with building 5 telescope and we are planning #6
- EUDET
  - the original!
- ANEMONE
  - copy for Bonn (owners)
- ACONITE
  - copy for ATLAS (owners) currently in TB22
- DATURA
  - copy for DESY currently in TB21
- CALADIUM
  - copy for Carlton, preparation for shipping ongoing
- DRYOPTERIS
  - copy for DESY
But ....

- Many telescope means also a lot of work
- Alone between February and September 2013 about 50 weeks of data taking
  - a lot of data will be accumulated
- EUTelescope (and also EUDAQ) needs to be maintained to make sure it does not get diluted or too many different versions being created (possibly not correct anymore)
- Tremendous effort by EUTelescope Team to get new release and documentation

Goals of this workshop
- getting to know each other
- sharing TB- and analysis experience and expertise
- combining and coordinating our efforts

Please use WiFi SSID EUTelescopeWorkshop2013, WPA/WPA2-PSK: KP4Wt9vX
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