A new DAQ for the ZEUS MVD telescope

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Introduction

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Introduction

the ZEUS MVD telescope in test beam chamber 22

testbeams essential in:

- **research**
- **developement**
- **and commissioning**

of HEP detectors

at DESY:

6 GeV electron testbeam facility and infrastructure

The testbeam

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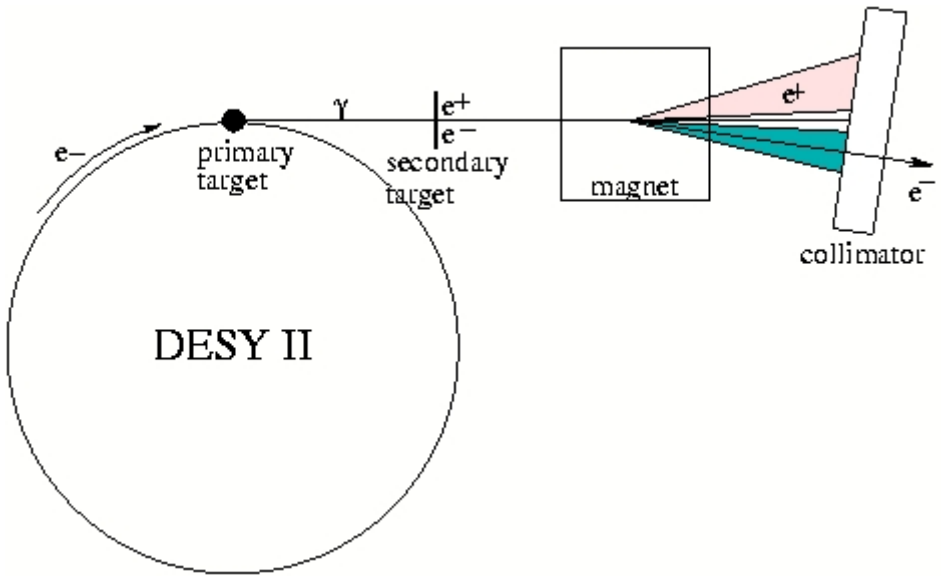
The testbeam



test beam generation at DESY

The ZEUS MVD telescope

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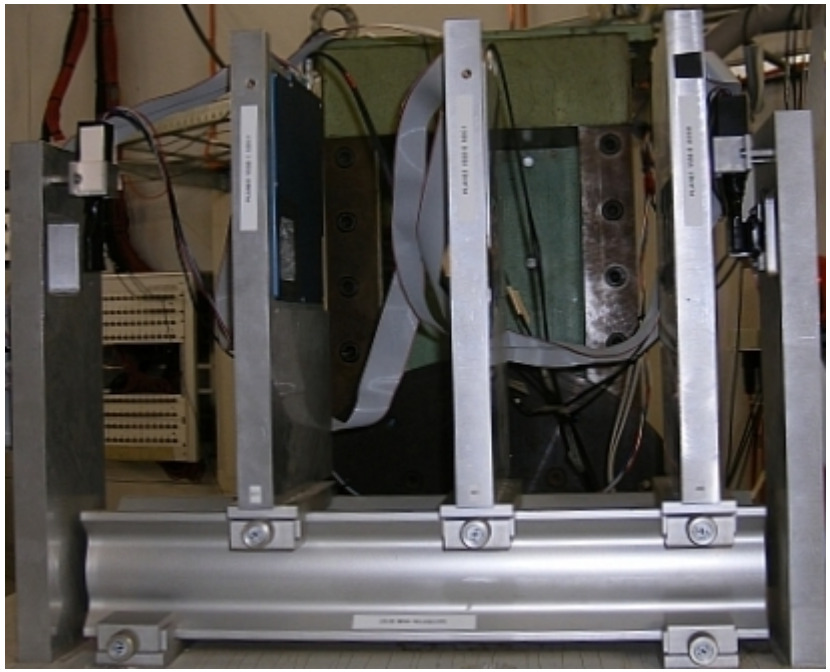
The ZEUS MVD telescope

the ZEUS MVD telescope in test beam chamber 22

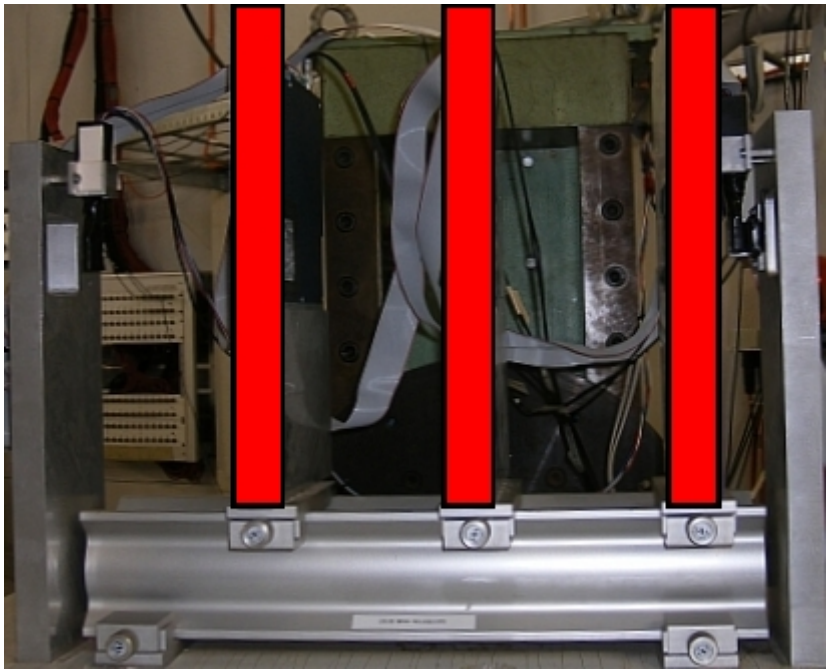
The ZEUS MVD telescope



MVD telescope, side view

The ZEUS MVD telescope

The telescope detector planes

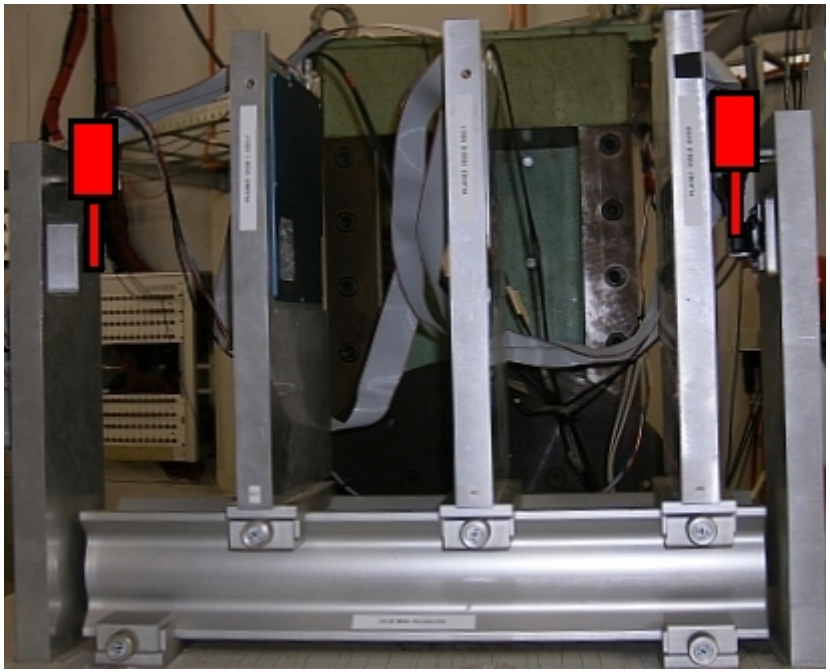


the telescope detector planes

- each provides 3 space coordinates
- 2 single sided silicon sensors each
- strip pitch: 25 µm
- readout pitch: 50 µm
- intrinsic resolution: < 15 µm

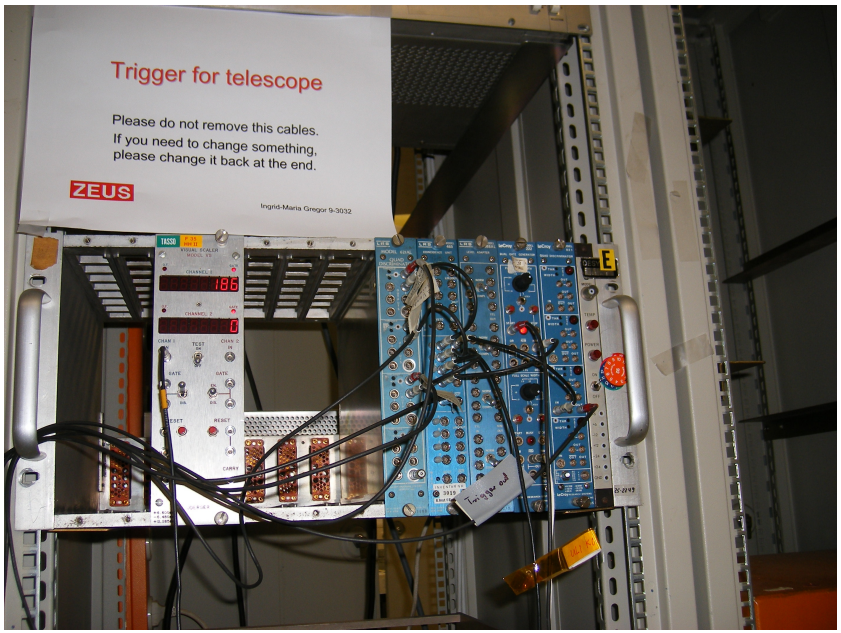
The ZEUS MVD telescope

The telescope trigger system



the telescope trigger system

- 3 plastic scintillators with PMTs
- signals combined with AND coincidence logic



trigger coincidence logic and external trigger

The ZEUS MVD telescope

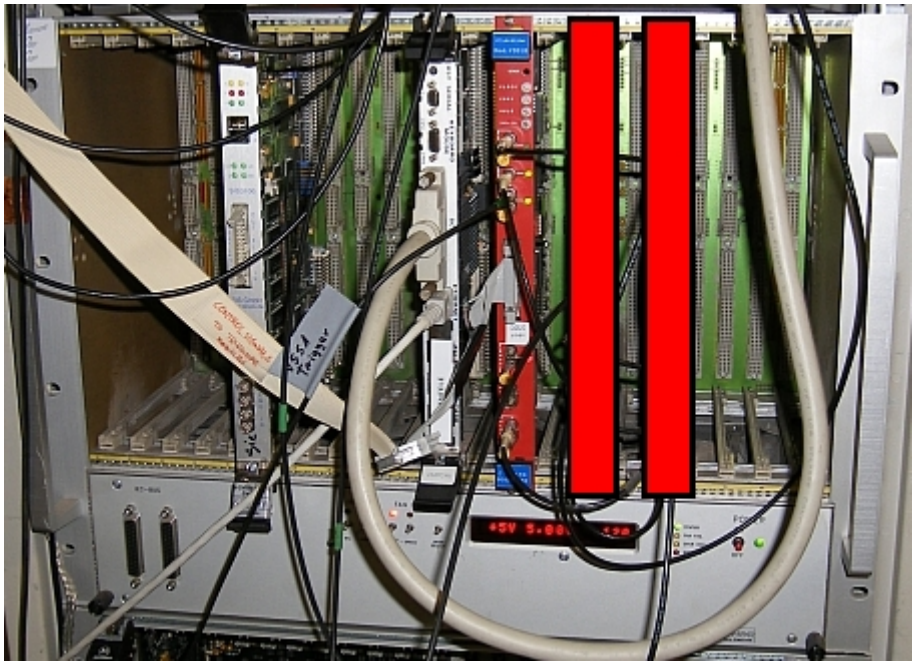
The data acquisition Hardware

VME crate with modules

VME crate with several modules:

The ZEUS MVD telescope

The data acquisition Hardware



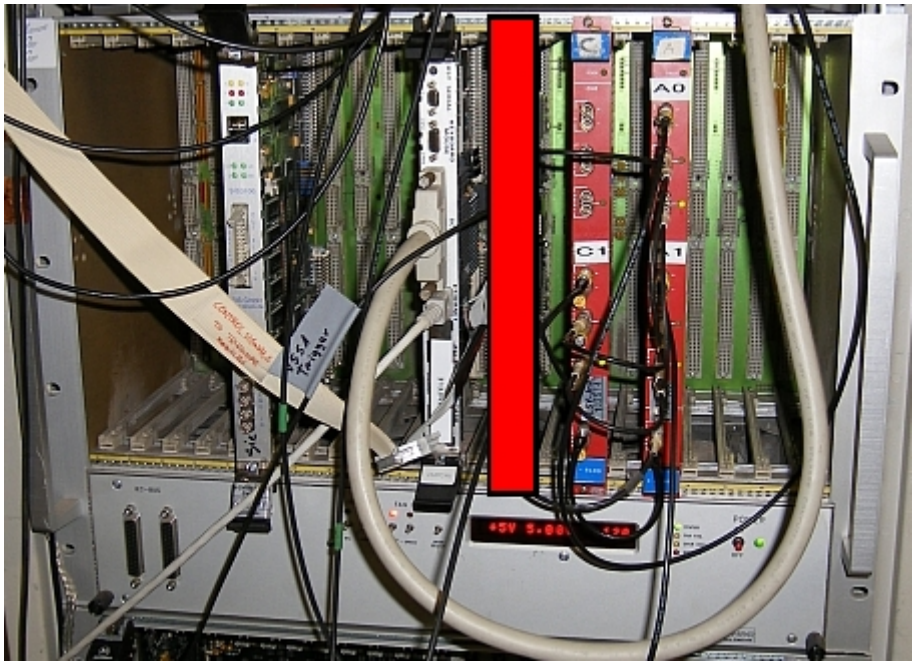
VME crate: V550 ADC modules

VME crate with several modules:

- 2x V550A ADC modules

The ZEUS MVD telescope

The data acquisition Hardware



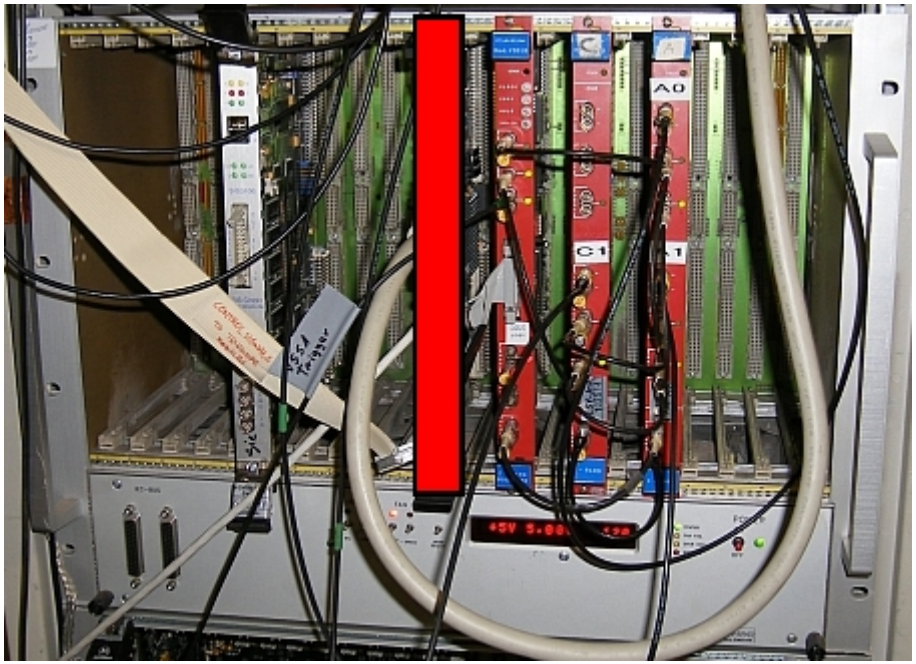
VME crate: V551B sequencer module

VME crate with several modules:

- **2x V550A ADC modules**
- **V551B sequencer module**

The ZEUS MVD telescope

The data acquisition Hardware



VME crate: CETIA single board computer

VME crate with several modules:

- **2x V550A ADC modules**
- **V551B sequencer module**
- **CETIA single-board computer**

Data Acquisition (DAQ)

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Data Acquisition (DAQ)

- C++ program(s)

- run on the CETIA single-board computer in the VME crate

- read out data from V550A modules

- store the data in binary data files on disk

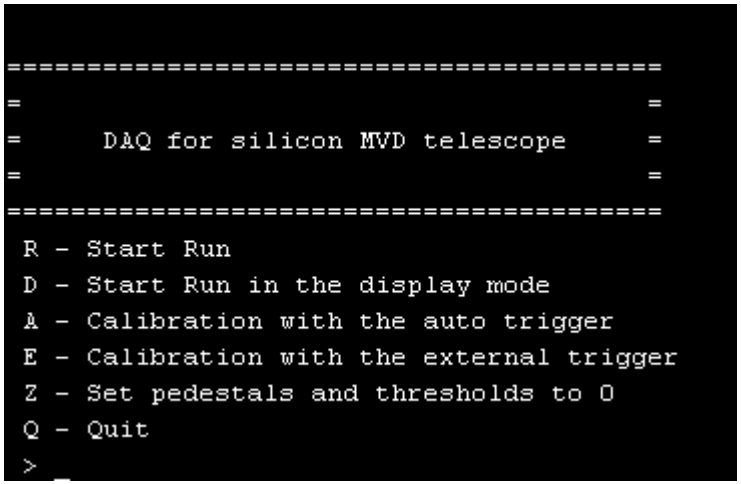
Data Acquisition (DAQ)

The DAQ program user menu

```
=========================================
=                                       =
=     DAQ for silicon MVD telescope     =
=                                       =
=========================================
 R - Start Run
 D - Start Run in the display mode
 A - Calibration with the auto trigger
 E - Calibration with the external trigger
 Z - Set pedestals and thresholds to 0
 Q - Quit
 >
```

Data Acquisition (DAQ)

The DAQ program user menu

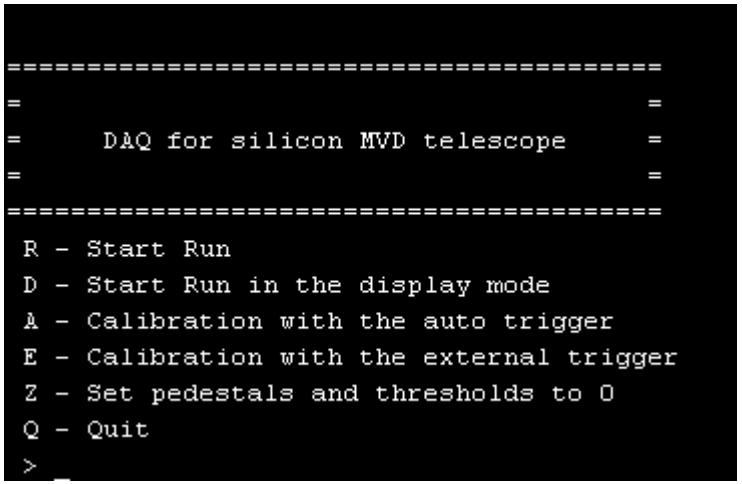


Run mode

- starts DAQ run
- writes ADC data to binary file

Data Acquisition (DAQ)

The DAQ program user menu



Display mode

=> later

Data Acquisition (DAQ)

The DAQ program user menu

```
=======================================
=                                     =
=     DAQ for silicon MVD telescope   =
=                                     =
=======================================
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```

Calibration mode

- resets ped & threshold memory
- data taking (1000 events)
- no beam, only background
- calculates ped & threshold
- rewrites ped & threshold memory

Data Acquisition (DAQ)

The display run mode

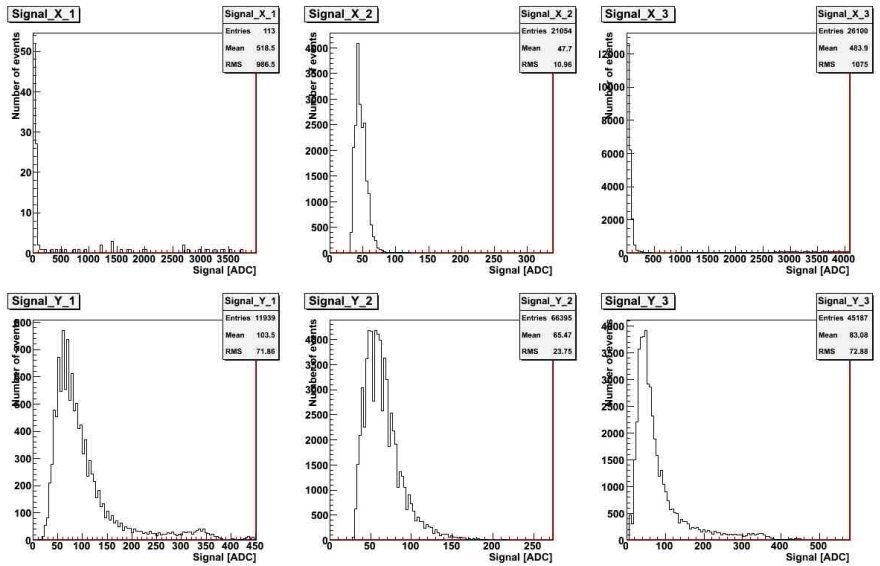
3 approaches:

Data Acquisition (DAQ)

The display run mode

3 approaches:

- **1st:**
  - **write a display file every 10 events**
  - **read out display file with ROOT-based program**
  - **create ROOT histograms with display data**



Data Acquisition (DAQ)

The display run mode

3 approaches:

- **2nd:**
  - **use network access (sockets)**
  - **send data of every 10th event to client**
  - **client program creates ROOT histograms**

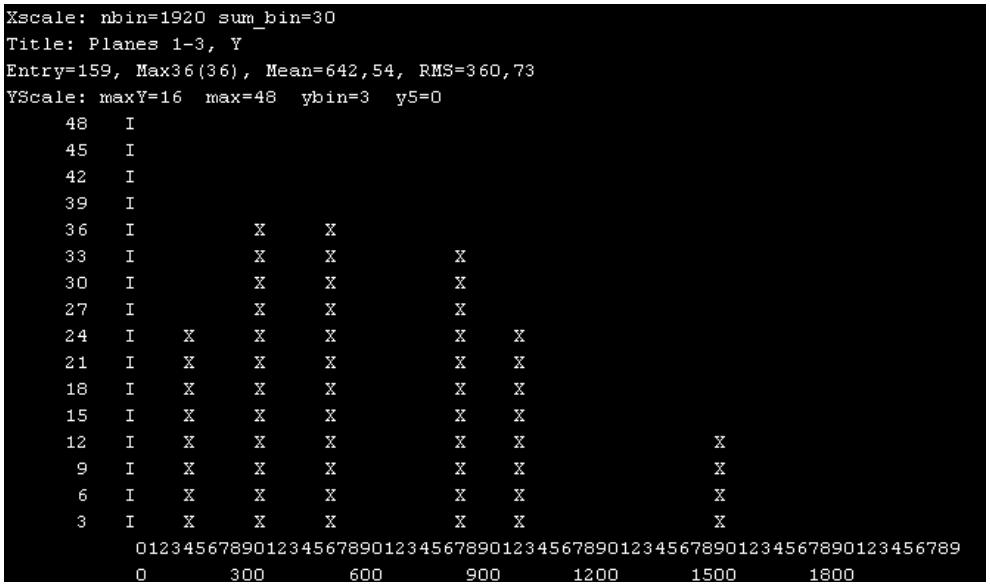
=> issue: major bug, not found yet
=> but: could be best sollution

Data Acquisition (DAQ)

The display run mode

3 approaches:

- 3rd: - use built-in ASCII histogram option of DAQ
- create histograms for every 10th event



ASCII histogram output

Results

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Results

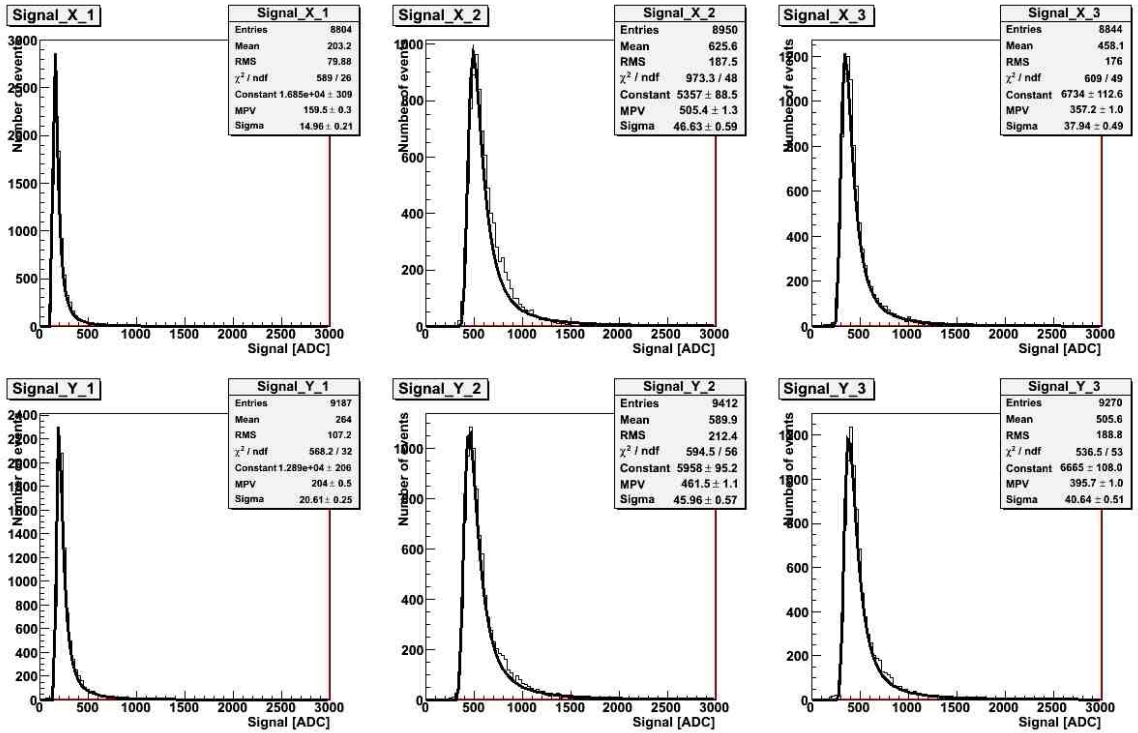
- analysation of binaries with ROOT-based analysis program

- multiple options:

Results

- analysation of binaries with ROOT-based analysis program

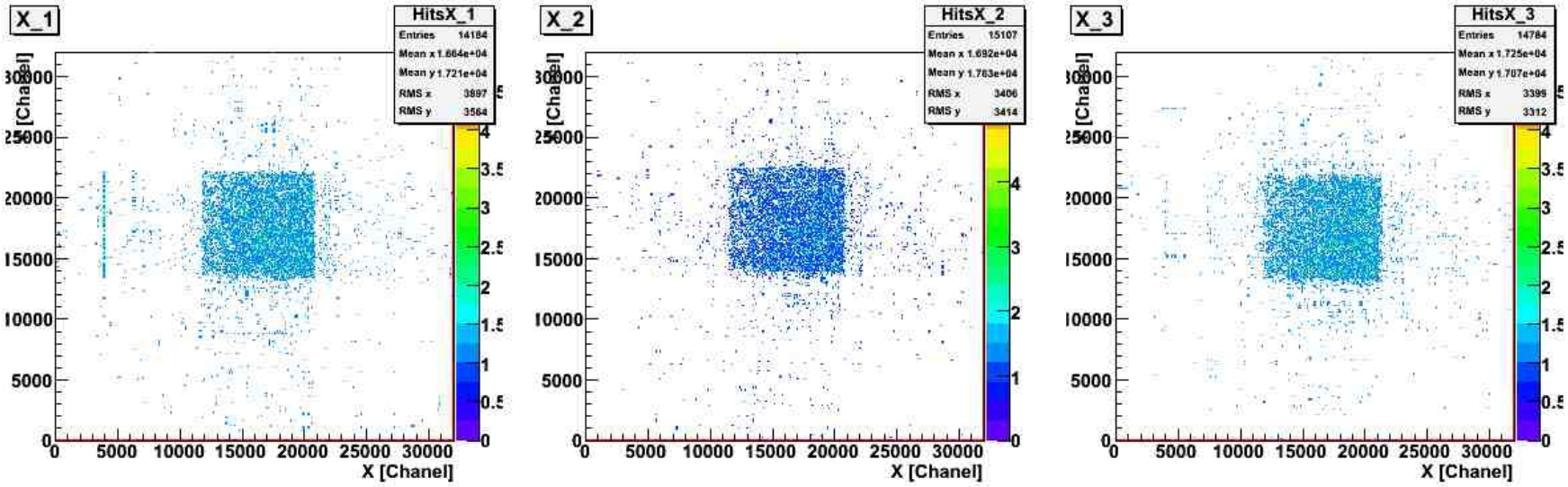
- multiple options:
  landau distribution fits



Results

- analysation of binaries with ROOT-based analysis program

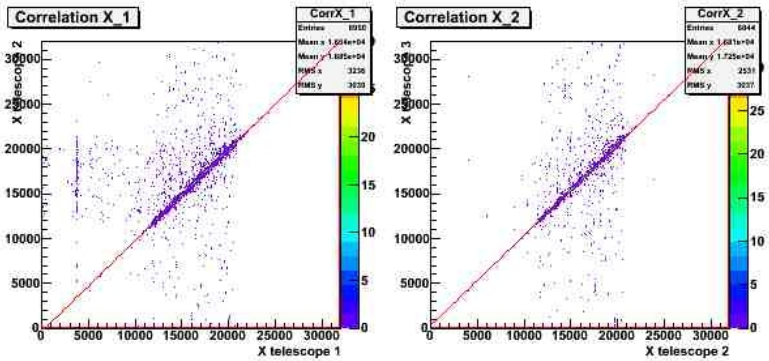
- multiple options:
  hit reconstruction

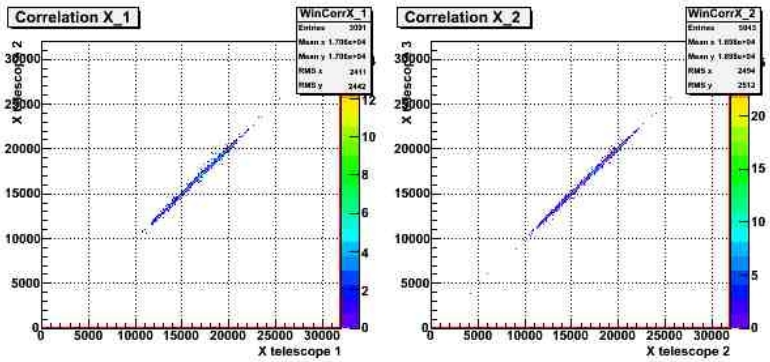


Results

- analysation of binaries with ROOT-based analysis program

- multiple options:
  X-Y correlation plots

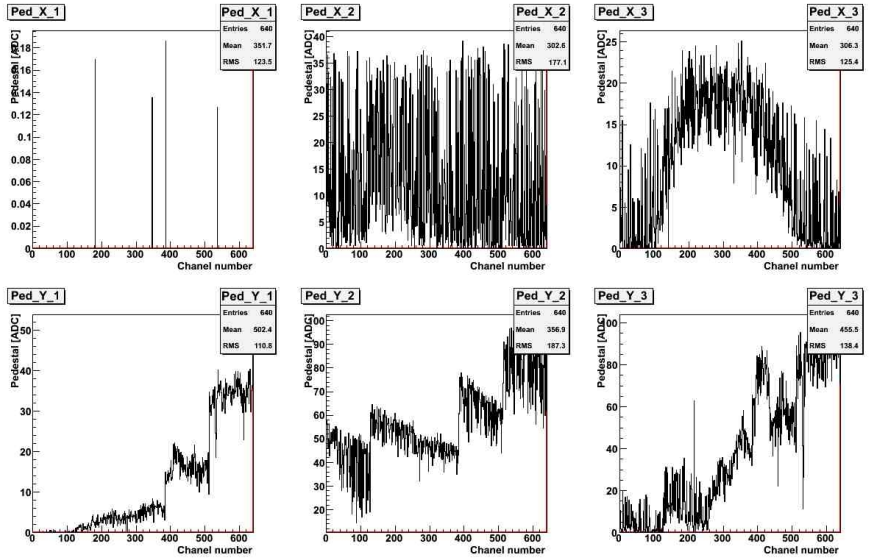




Results

- analysation of binaries with ROOT-based analysis program

- multiple options:
  determine pedestals and noise



=> histograms of latest data run do not look right!
=> binary file somehow corrupted!

Outlook

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Outlook

- binary file of used DAQ somehow corrupted
  => find and fix bug

Outlook

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  => find and fix bug
- find and fix error in network-based DAQ

Outlook

- binary file of used DAQ somehow corrupted
  => find and fix bug
- find and fix error in network-based DAQ
- enhance network capabilities of DAQ
  => make DAQ software server-based
  => clients (users) can remotely operate DAQ

References

- Technical Information Manual, MOD V 551 B, July 2003

- Technical Information Manual, MOD V 550 B, August 2002

- Characterisation and Monte-Carlo study of the T22 Electron Test Beam Line at DESY II, EUDET-Memo-2007-49

Thank you!

Thank you!