Beamline 22

Experimental study with The BACCHUS detector

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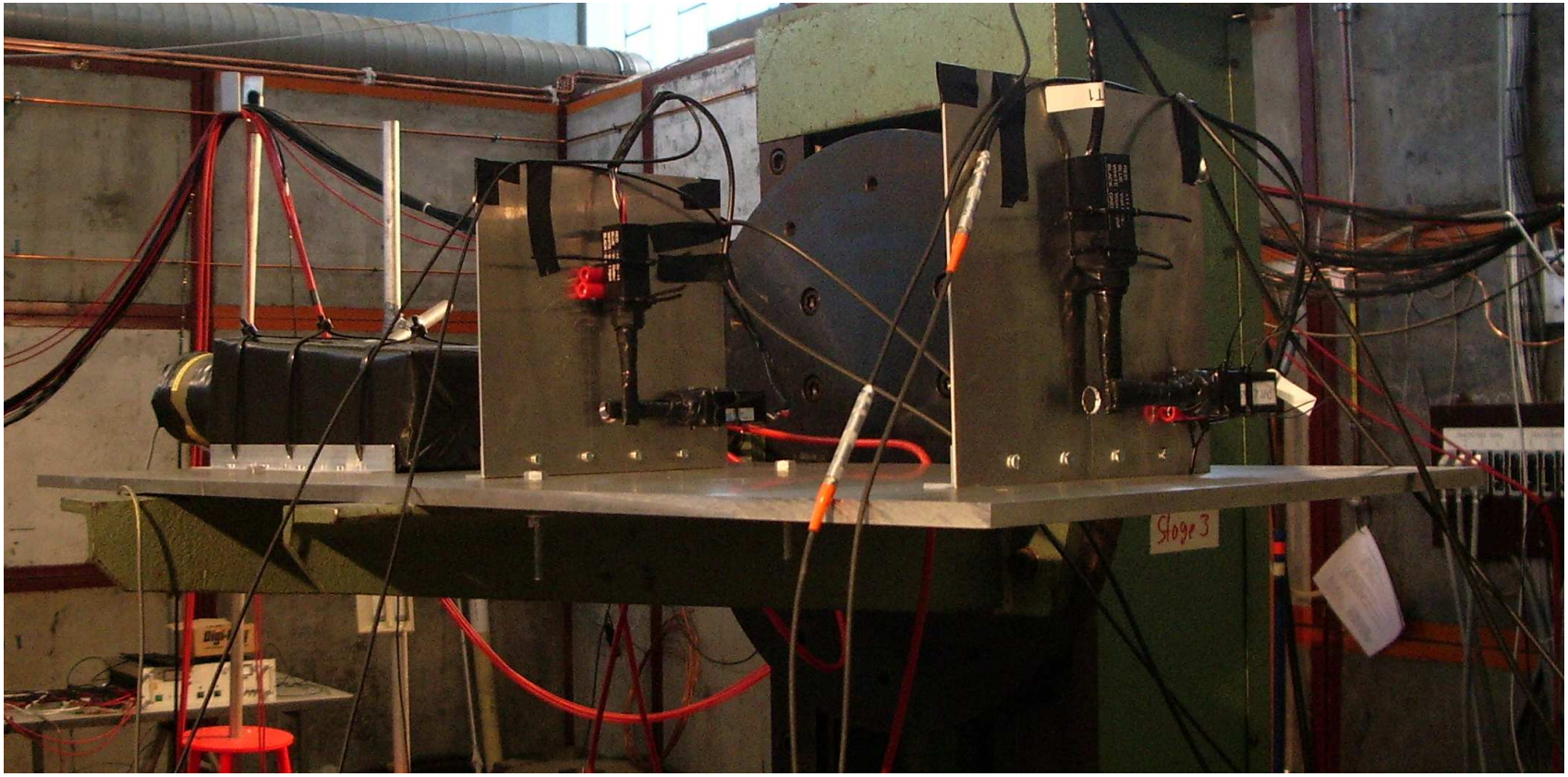
14. September 2007

DESY summer stundent program 2007

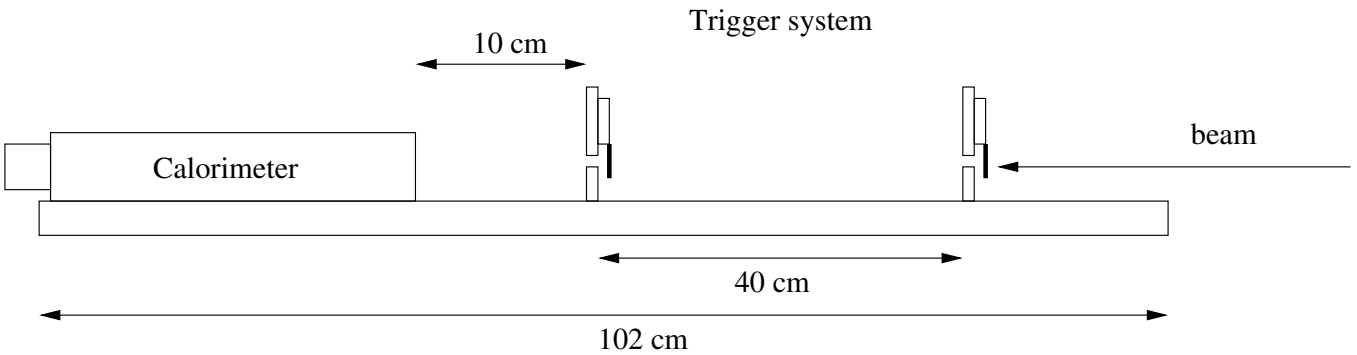
Outline

Detector overview

The BACCHUS detector
(BeAm Characterizing Calorimeter pincHed from argUS)



The detector parts



- The Support: Self made out of aluminium, mounted into a mechanical stage.→Alignment needed
- The trigger system:4 scintillators counters connected to PMT's.→They select the beam
- The calorimeter: Lead glass block from ARGUS, PMT connected to meassure the photons from shower.→Energy

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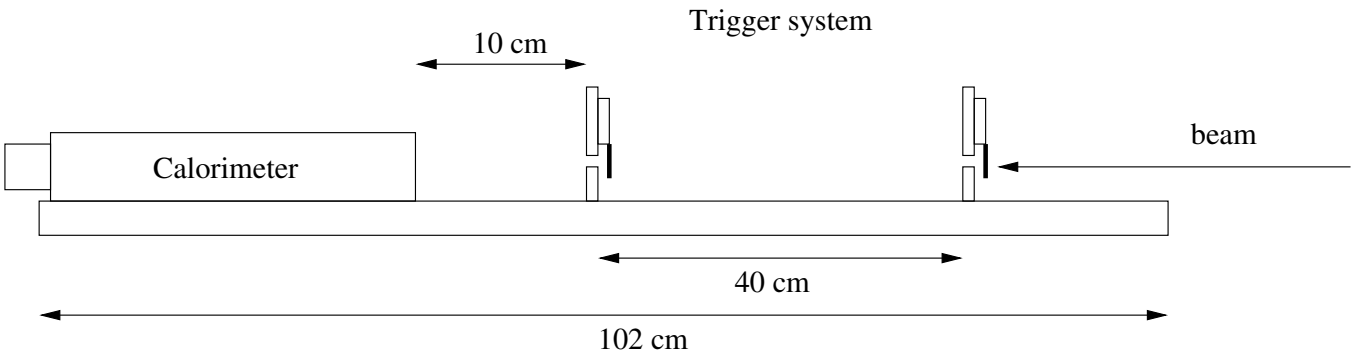

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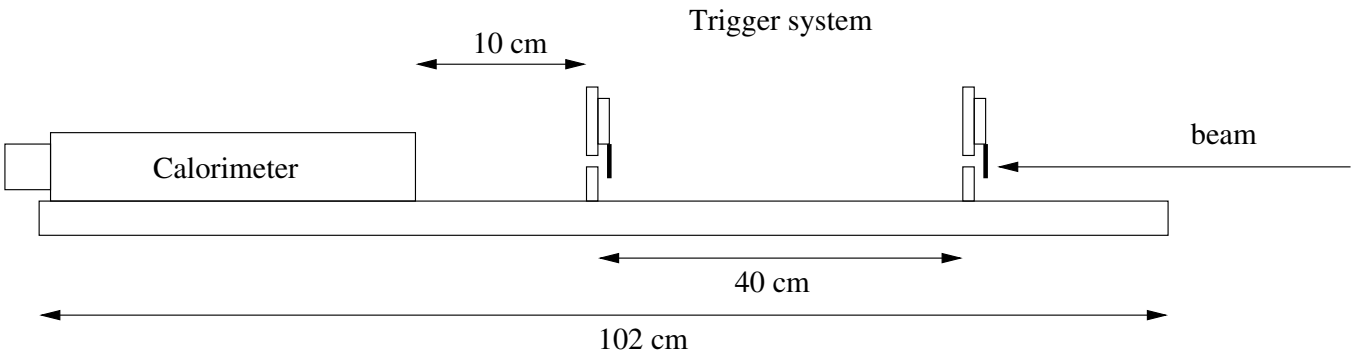

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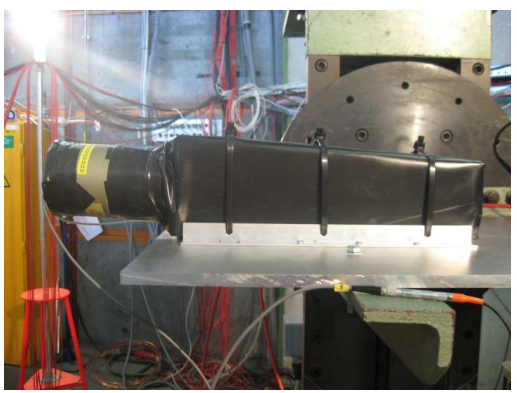
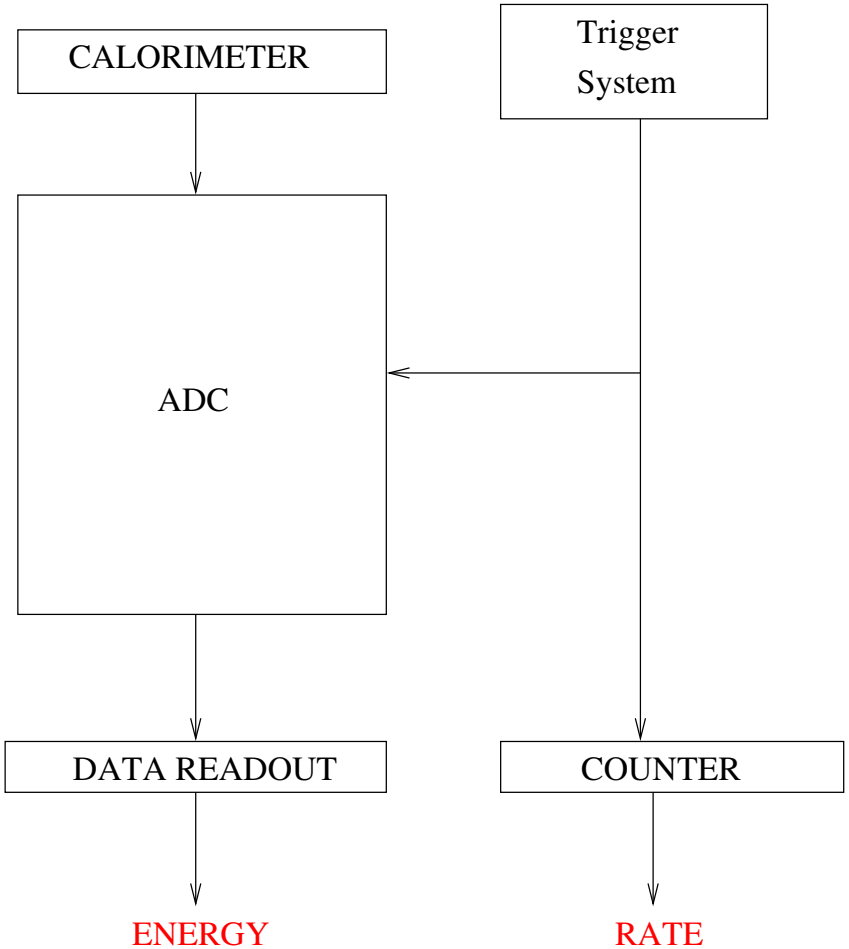
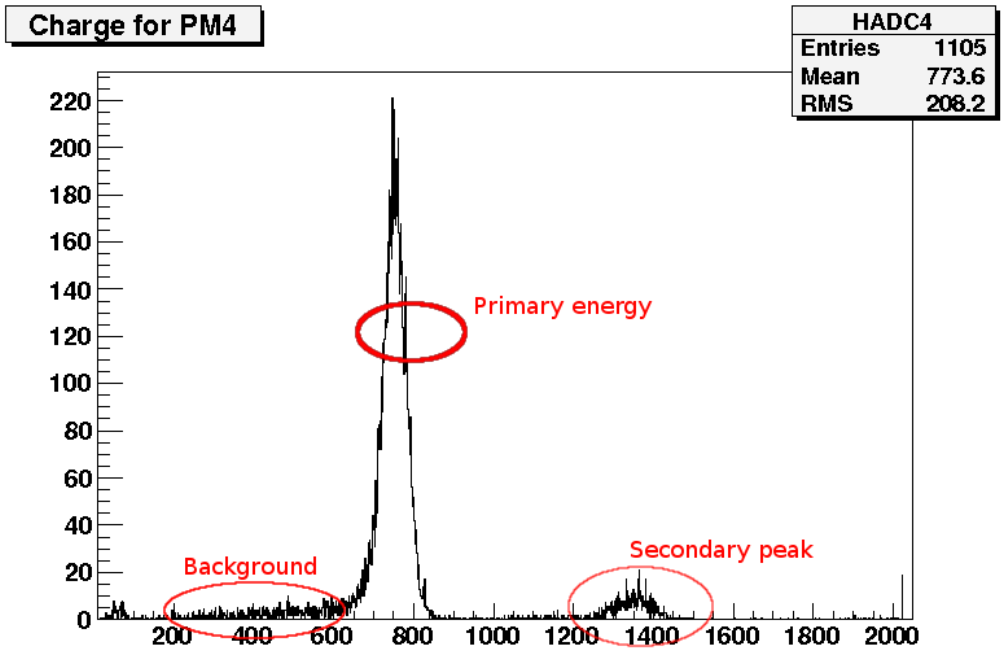


How does the detector work?

1. An electron comes into the experimental area.
   - It can hit the 4 scintillators → trigger signal.
   - It can hit the calorimeter → energy readout.
2. ADC work. → We register and store the calorimeter signal only when the trigger signal is generated. We trigger only the more o less parallel particles.



Data analysis



We analyse this data using ROOT

- The primary peak → Primary energy.
- The background → Contamination of the beam.
- The secondary peak → Two hits in the calorimeter.

From the trigger signal, using a counter we have also RATES

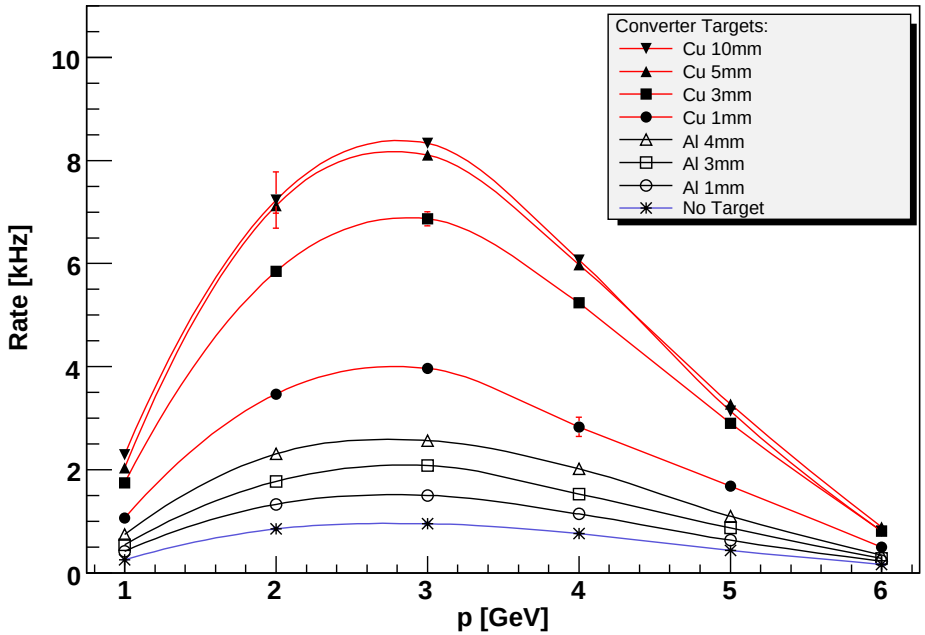
Parameters that we had change

- Converter Target $\longrightarrow$ 7 different.
- Momentum selection in the magnet.
- Primary target.

Next results with DESY II at 7 GeV.

Rates for different converter targets

Targets

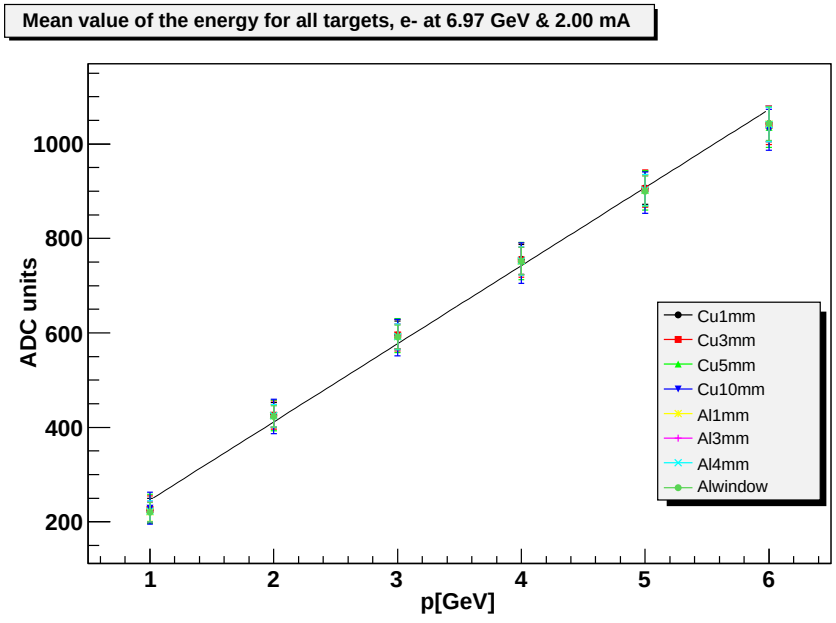


- The rates for different momentum selection
  - Grows with the thickness of the target.
  - Low rates for energies close to desy II energies, expected, 1/E bremmstrahlung spectrum.

- *Not linear with the thickness!!*
- *Not higher rates for low energies!!*

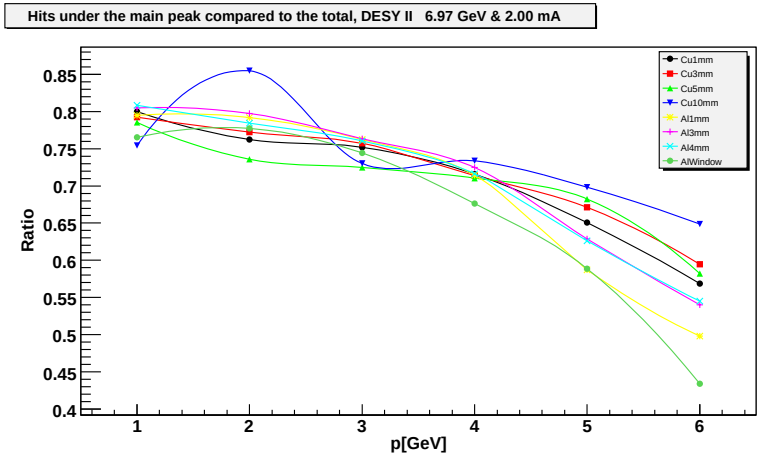
We have not enough simulated data to compare with this, longer runs crucial to understand the rates data.

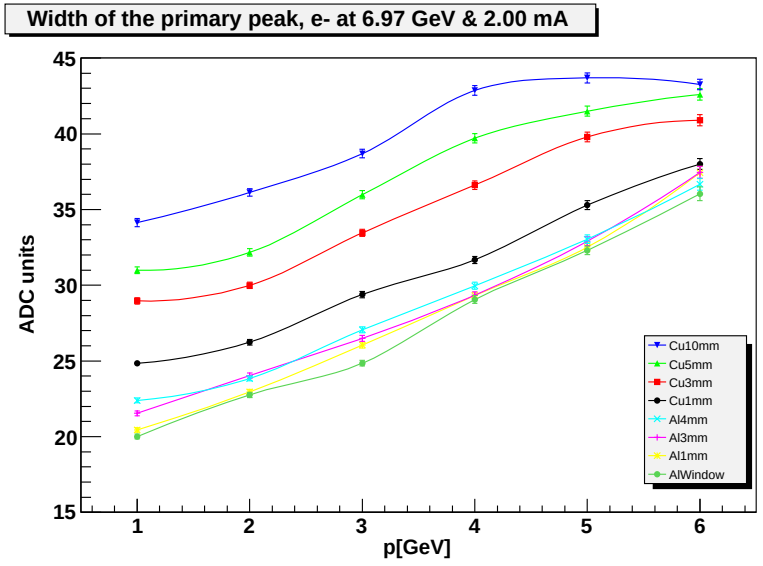
Energy distribution for different converter targets



- The mean value of the energy → Linear relationship & no change with the material.
- *From the simulation → Linear relationship observed*

Contamination of the beam





- The ratio of hits in the calorimeter around the primary energy → Lot of contamination for 6 GeV.
- The width of the primary peak also grows → The beam energy loses definition

Using a different primary target

Comparison of rates between normal fiber and fiber bundle,
DESY II 0.27 mA and 3 GeV/c

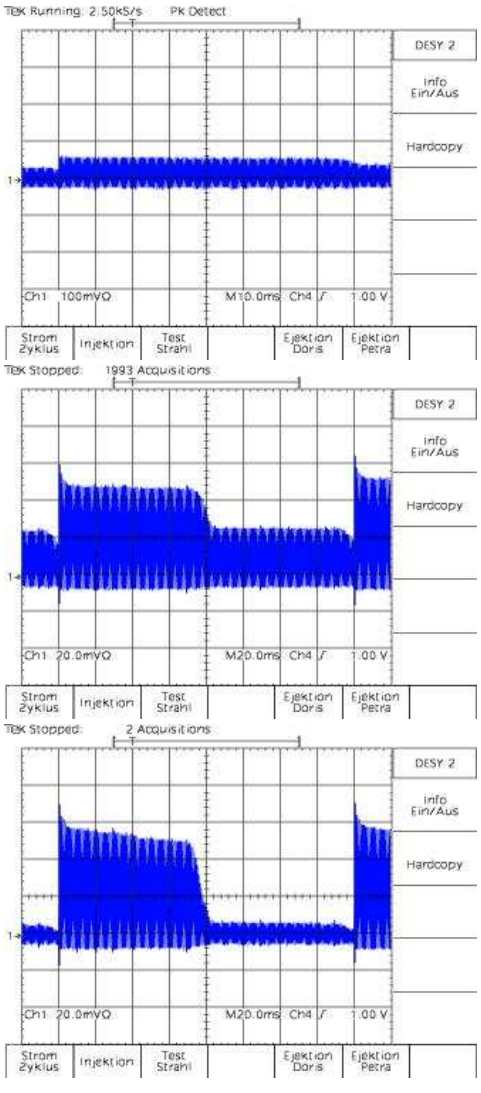
Rate for 7 μm target	Rate for fiber bundle
770 ± 20 Hz	2500 ± 100 Hz

We gain a factor 3, *In simulation only 1.2, what is happening?*
, important for low current environments.

- *upcoming of PETRA III $\rightarrow$ low current running in DESY II*

Problems with affecting DESY II beam? or PETRA III work?

Influence of the target on the beam



- Without any fiber inside.
- With the single fiber inside $\rightarrow$ 30% looses during deacceleration, no problem.
- With the thick target inside $\rightarrow$ 70% looses during deacceleration, looses during acceleration, may be a problem!
- More studies needed!!.

Conclusions and outview

- Lots of data collected for future Test Beam users.
- Detector and software for analysis available for upcoming studies.
- To understand better the experimental data : More data from the simulation needed.