HEPHY
Institute of High Energy Physics

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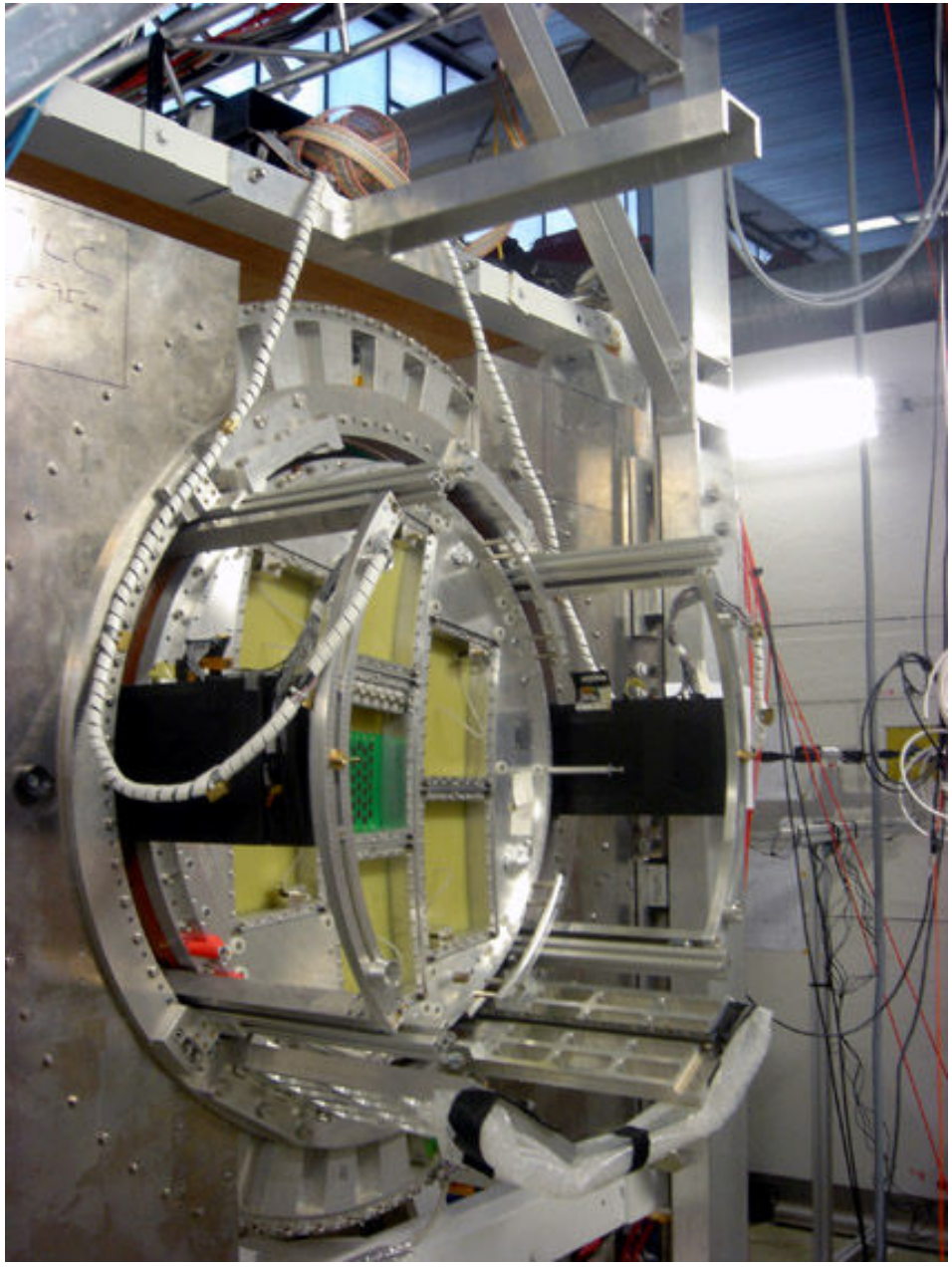
Österreichische Akademie der Wissenschaften



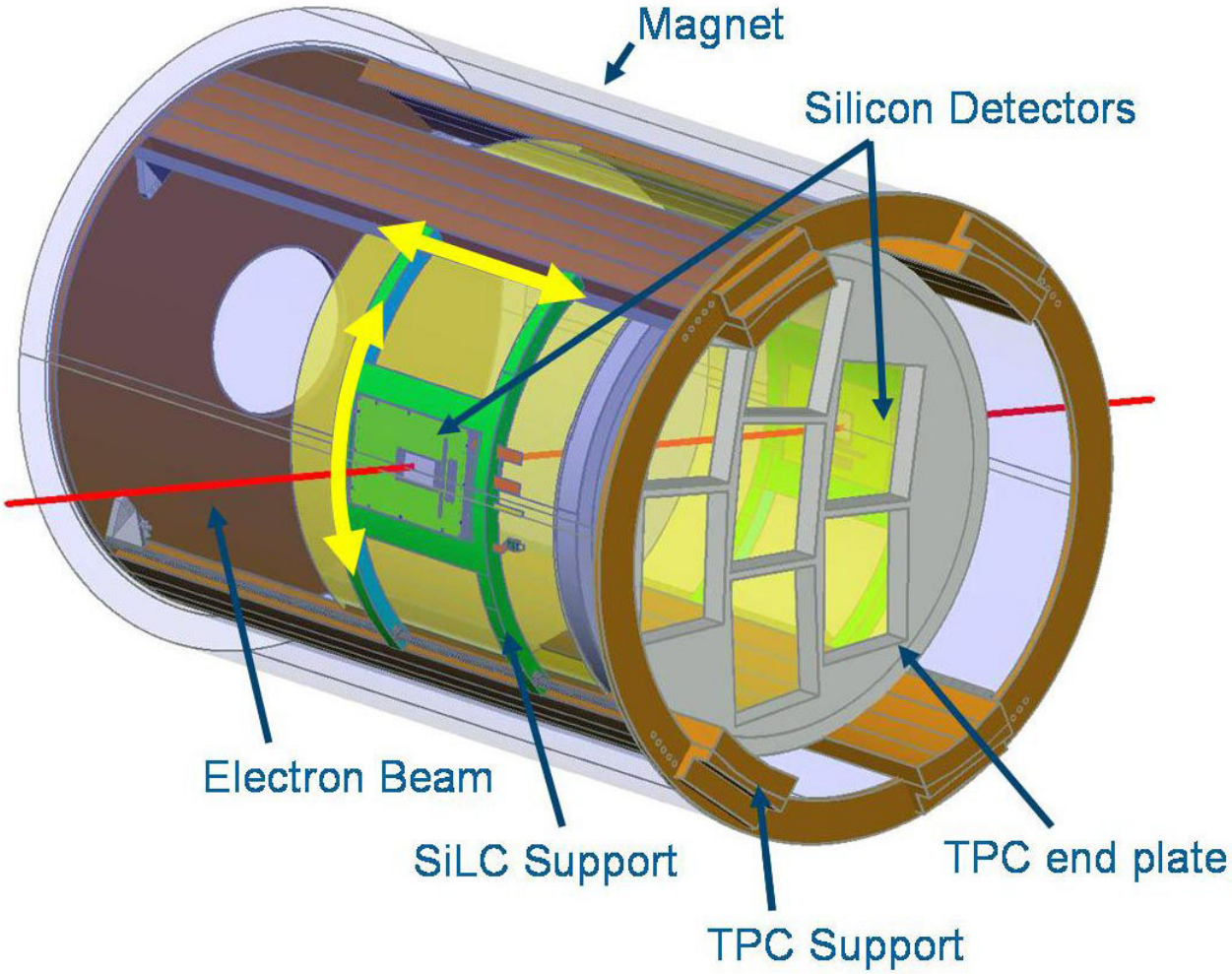
Silicon + Micromegas Combined Test Beam in November

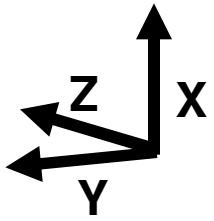
Stephan Haensel

SiLC meeting

10.12.2009

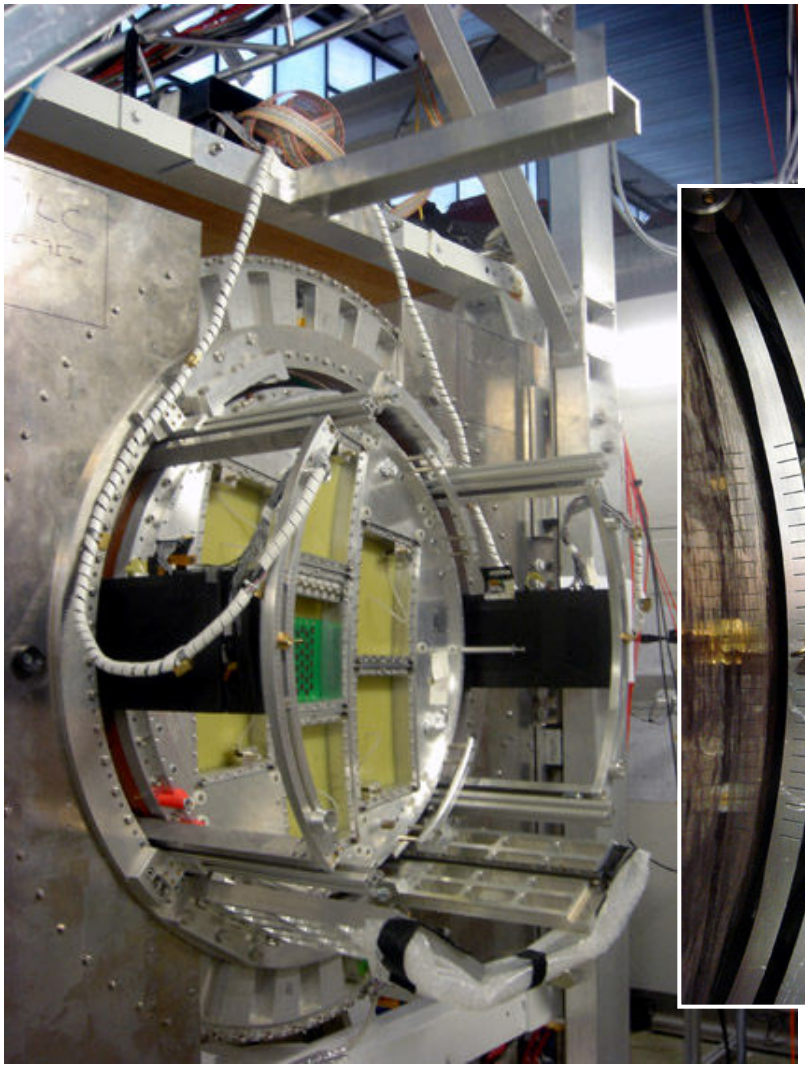
Coordinate System





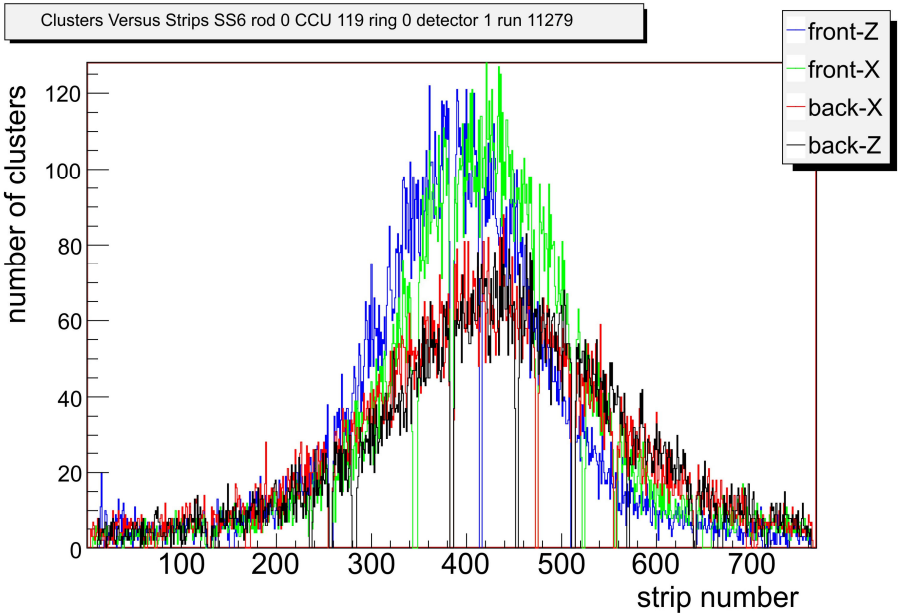
(Y = beam direction, Z = drift distance)

final tests @ DESY in October - no TPC-readout



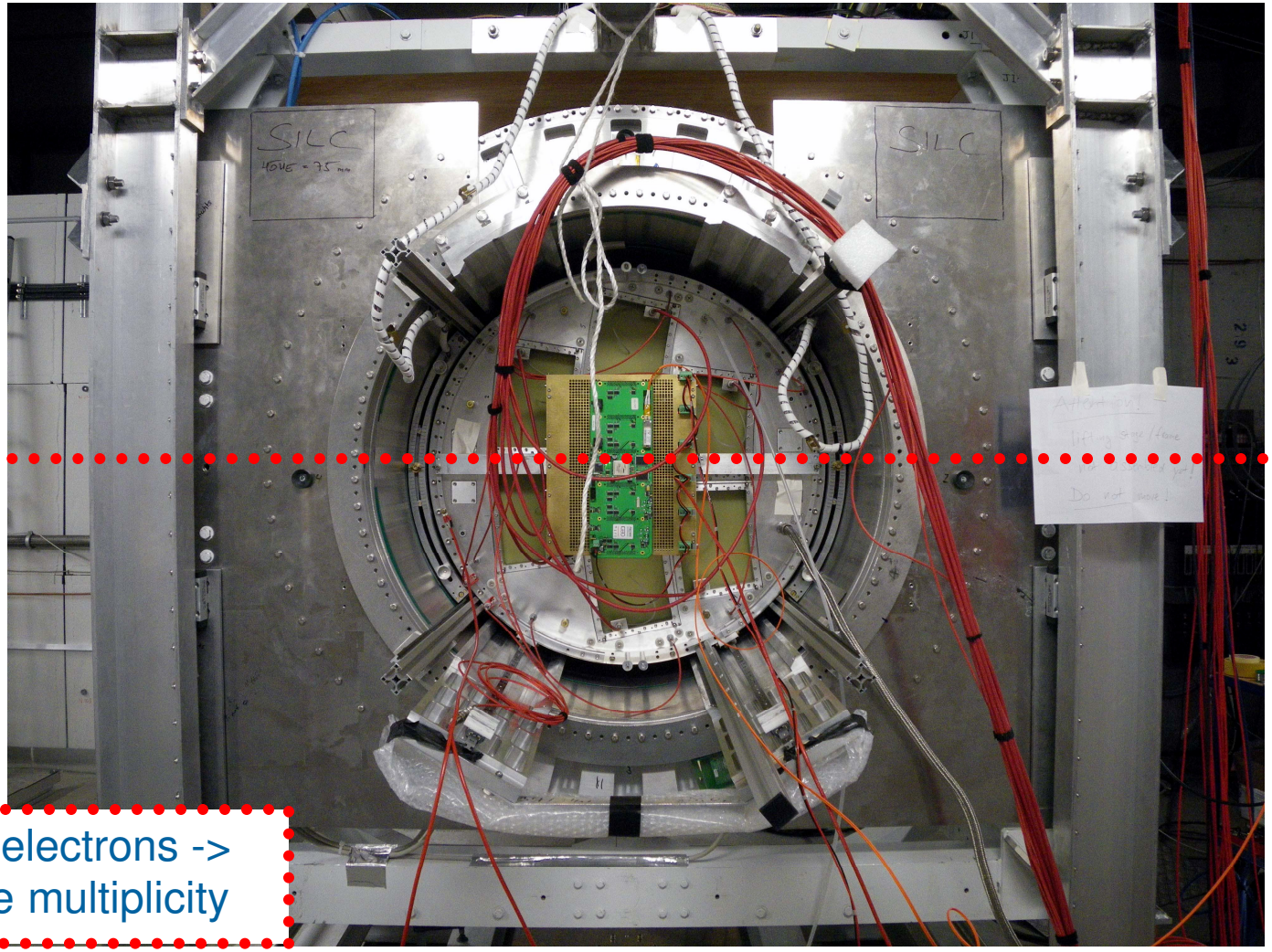
silicon envelope outside the gap between magnet and TPC

detector module inside the gap



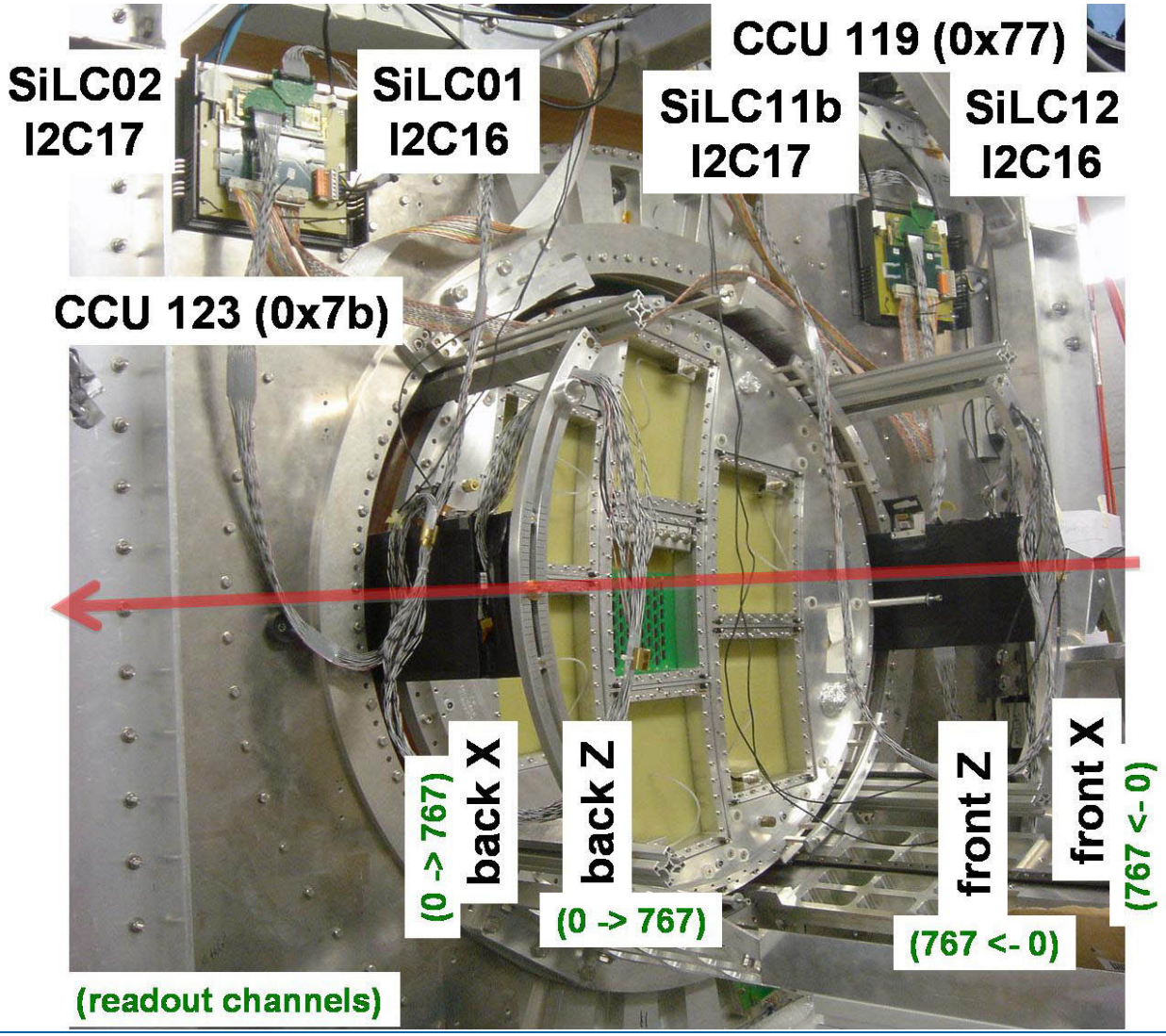
overlay of the cluster versus strips of all four silicon sensor modules

Combined Data-Taking November 2009



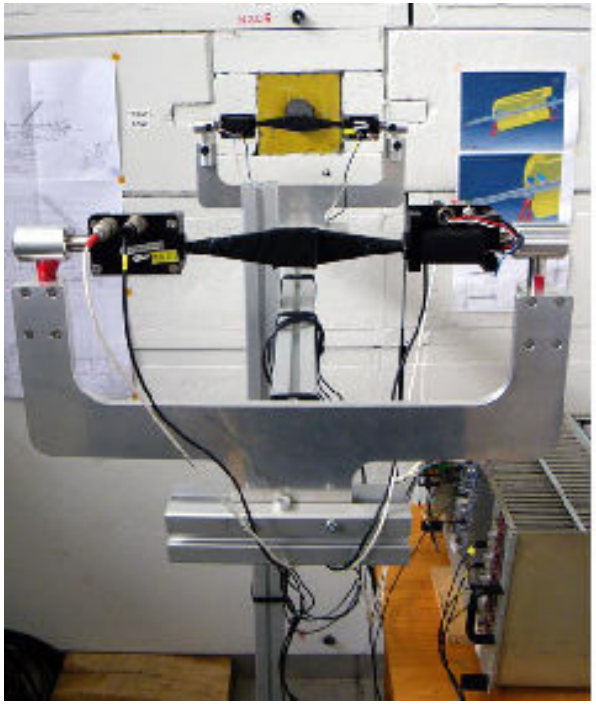
5.6 GeV/c electrons ->
to minimize multiplicity

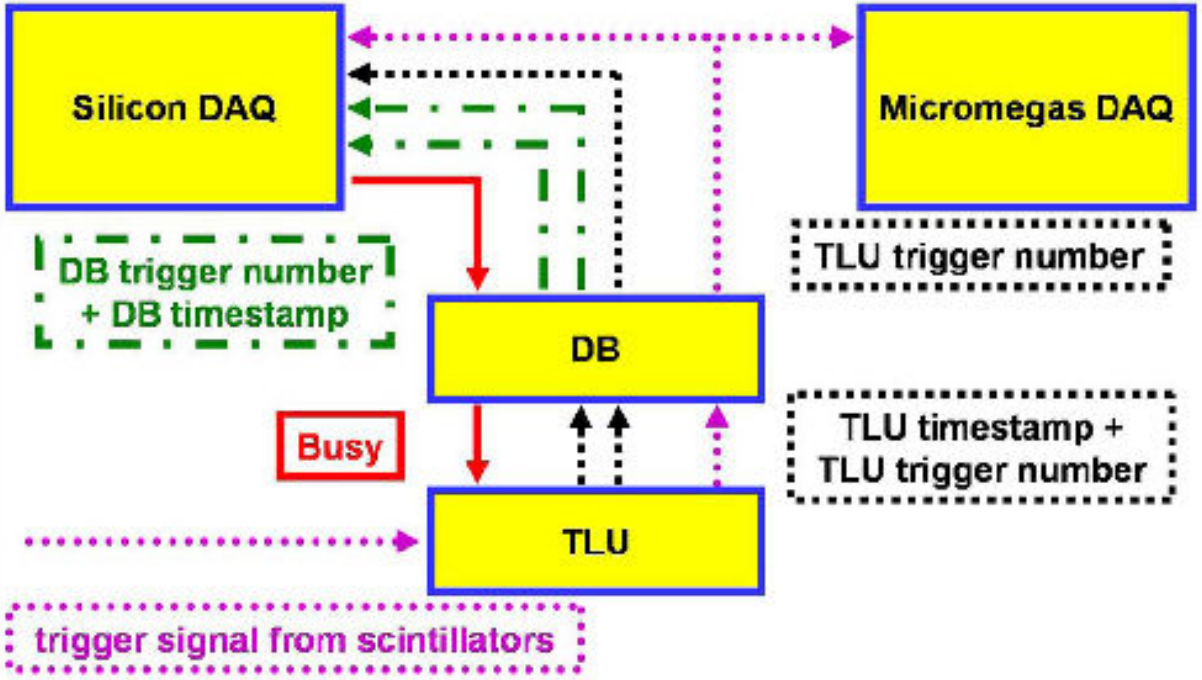
Geometry of the Silicon Sensors



Trigger Logic

- the initial idea: both data acquisition systems include the time stamp and the trigger number provided by the DB into their data files to ensure an easy matching of the data.
- Unfortunately this was not implemented in the TPC DAQ, leading to the problem in the data analysis, that we have no common number to allocate the events of the silicon with those of the TPC.

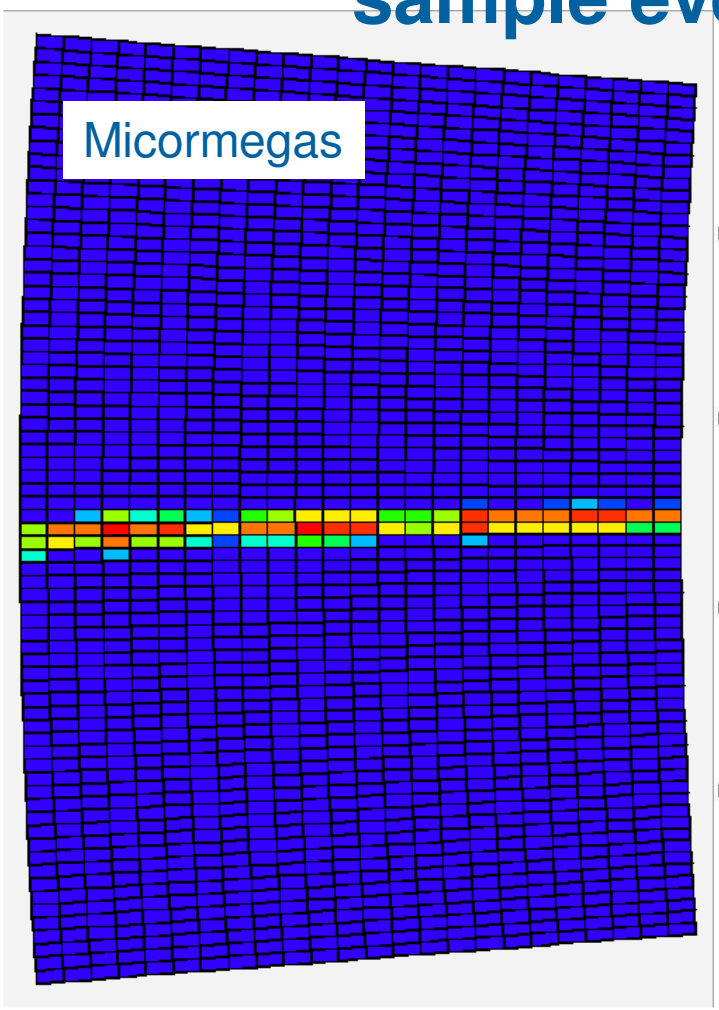




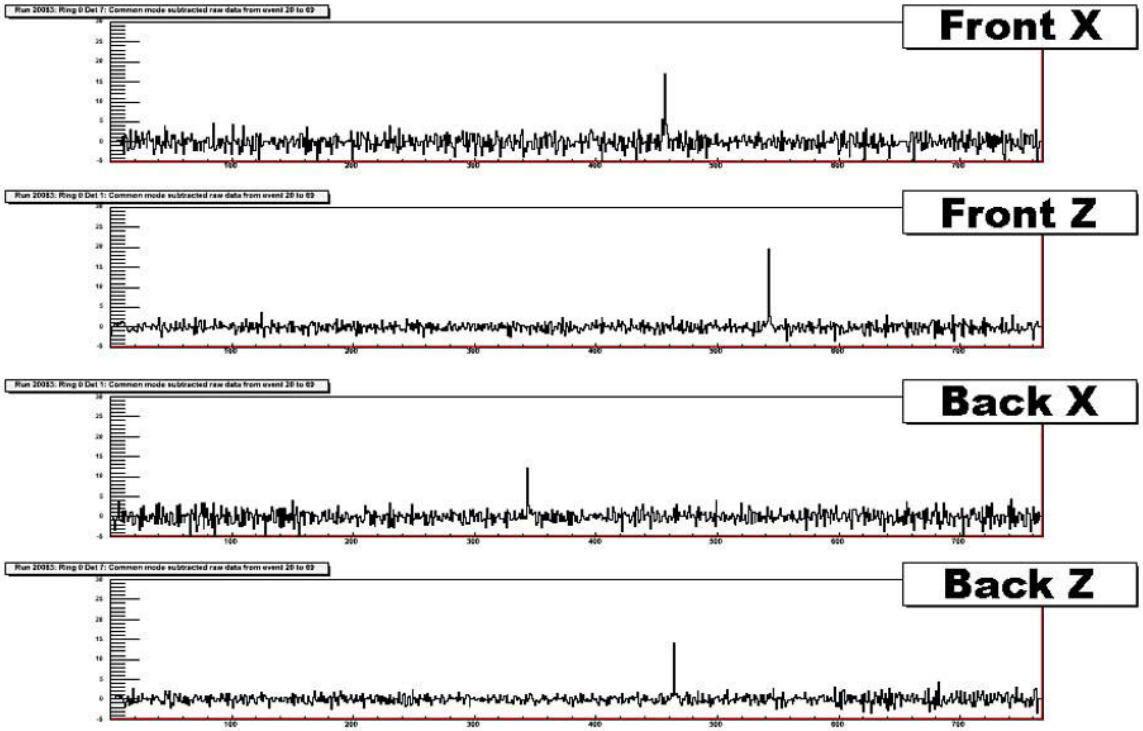
allocating the events

- To guarantee that both systems use the same trigger for the same event:
  - before the start of data taking a busy signal is send from the DB to the TLU and from the silicon DAQ to the DB, preventing the DB to accept a trigger from the TLU
  - at the time both DAQ systems are ready for data taking the busy from the silicon DAQ is ended, allowing the DB to end its busy to the TLU
  - DB intern delay was set to 100 ms
- To ensure that consecutive events in the two data files refer to the same triggers the frequency of events with just one track in both DAQ systems has to be matched.
- This was done by hand for the first couple of events during the test beam and looked promising -> has to be verified for all events

sample event with just one track

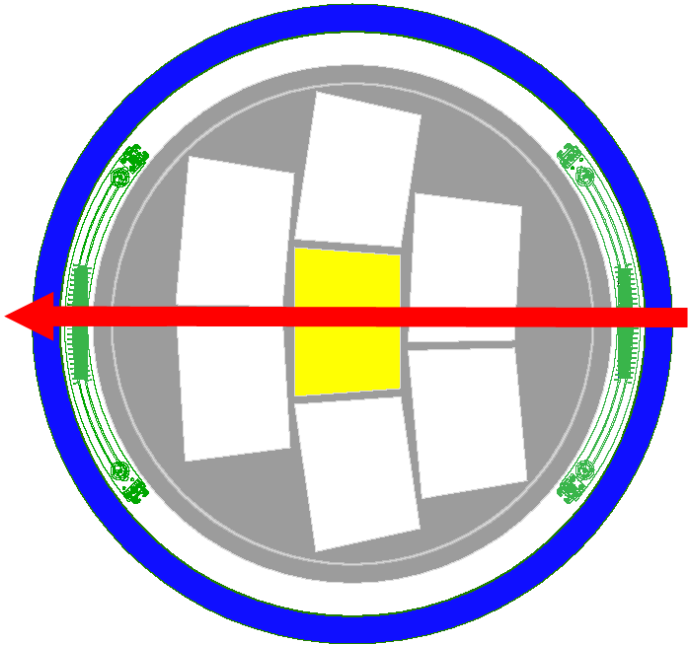


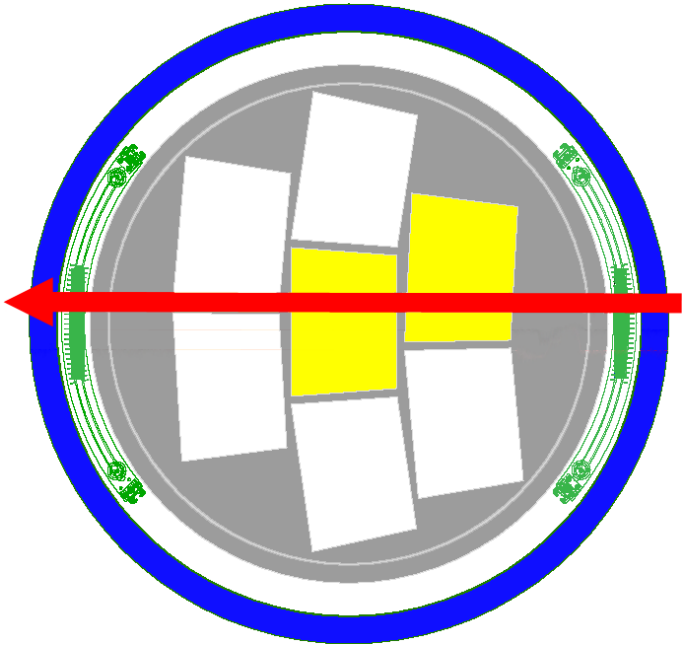
Silicon



due to beam intensity and multiple scattering only ~28% of the events have exactly one cluster in all four silicon layers

We took data with two different setups:



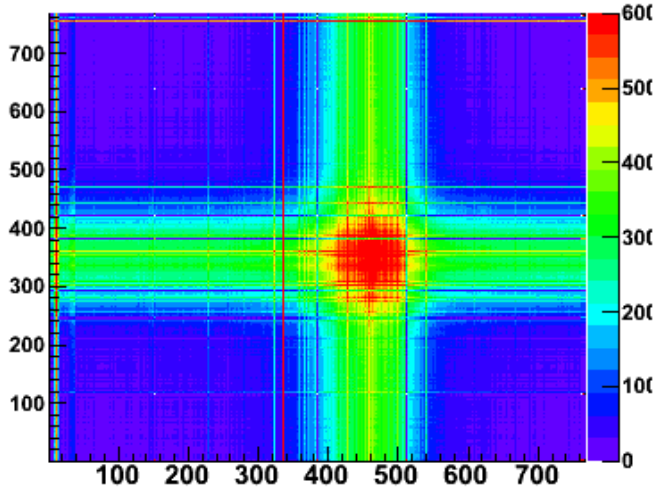


1) 20,000 events with one Micromegas module in the centre of the TPC end plate

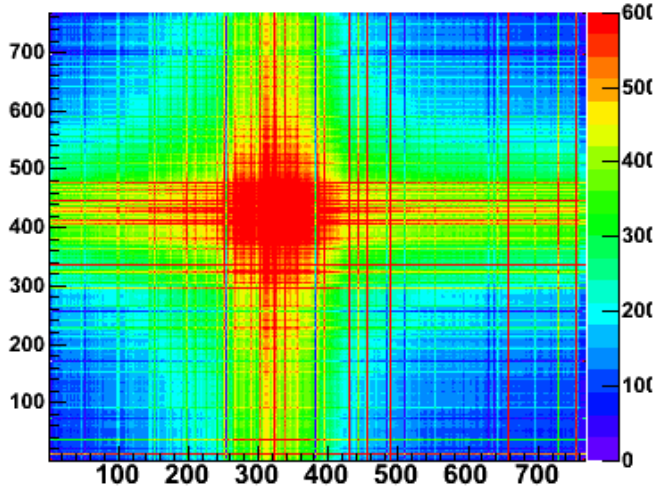
2) 60,000 events with two Micromegas modules recording the events at the same time

first look at the data

front modules



back modules



Hit Profile of the 768 strips (50 µm pitch) of the silicon strip sensors - Run 20075 (42434 events)

x-axis = sensor which measures z

y-axis = sensor which measures x

-> for each cluster in the silicon sensors, the strip with the highest signal was counted

-> from the top plot the diameter of the beam can be determined to be about 5 mm

-> the bottom plot shows that we get quite a lot of (charged) secondary particles

Verified by looking at the mean number of clusters per event of the four silicon sensors:

front sensors ~1,4 clusters/events

back sensors ~ 2,8 clusters/events

Status – 10.12.2009

- Analysis is now in the beginning – has to start with the verification that both systems recorded the same tracks
- Till now the analysis software for the silicon only runs on the silicon DAQ PC at DESY – unfortunately this DAQ PC has some major problems and crashes very often
- I started to install the analysis software on another computer - quite problematic, since the software needs old versions of SL, root, compilers,… - but the effort is ongoing and things look promising

- More detailed information in
  - EUDET-Memo-2009-017 (to be ready soon)
- Test beam logbook: http://elog.hephy.at/LP-TPC/
- Picture gallery: http://www.hephy.at/gallery2/v/Halbleiter/testbeams/lp-tpc/