JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

RICH Trigger Algorithm and Online Matching with MDC Tracks

Justus-Liebig-Universität Gießen

Johannes Roskoss

Outline

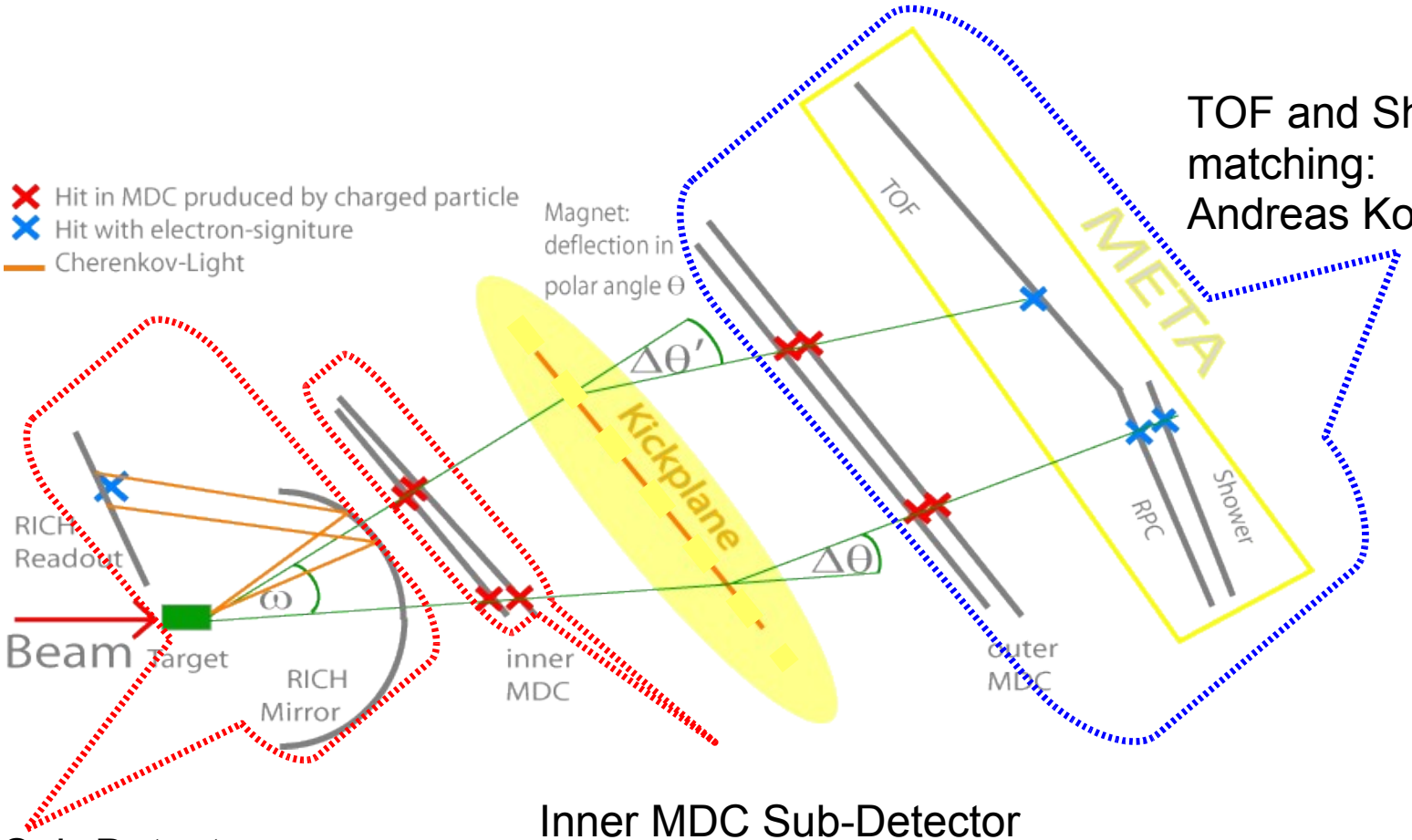
- Motivation
- The HADES Detector
- MDC- and RICH-Algorithms
- Implementation on the Compute Node
- Conclusion

Motivation

- PANDA has lots of new and unforseen requirements
- We should be prepared as good as possible
- Learning from existing and running Experiments

- HADES as a testcase for PANDA (DAQ and Trigger)
- Real data is available
- Test during Beamtime end of 2009
- Learn how to use the Compute Node
- Transform or reuse parts of the algorithms

Scheme of the HADES-Detector

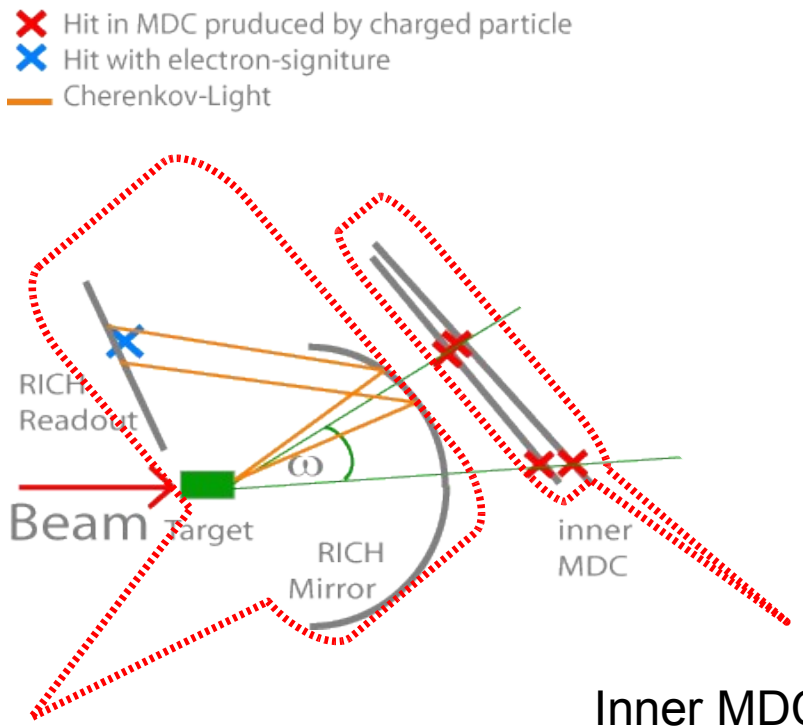


TOF and Shower matching: Andreas Kopp

RICH Sub-Detector

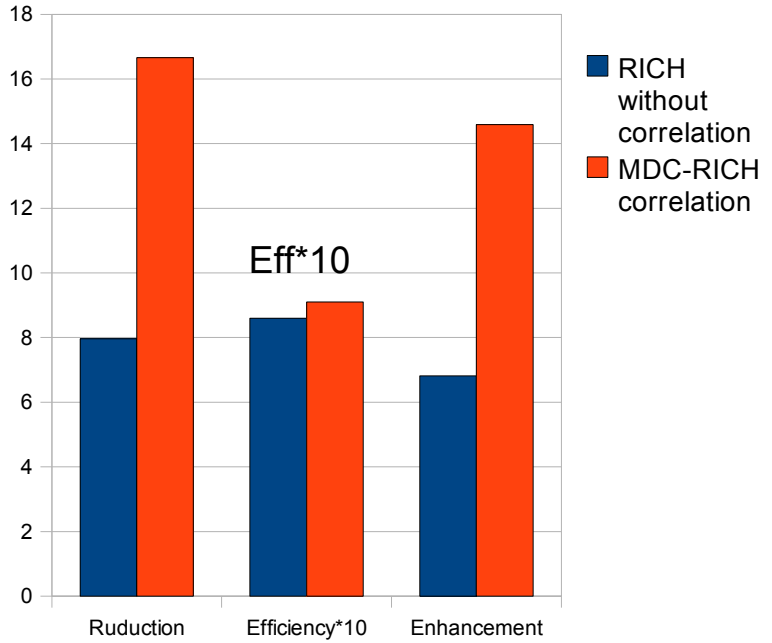
Inner MDC Sub-Detector

Scheme of the HADES-Detector



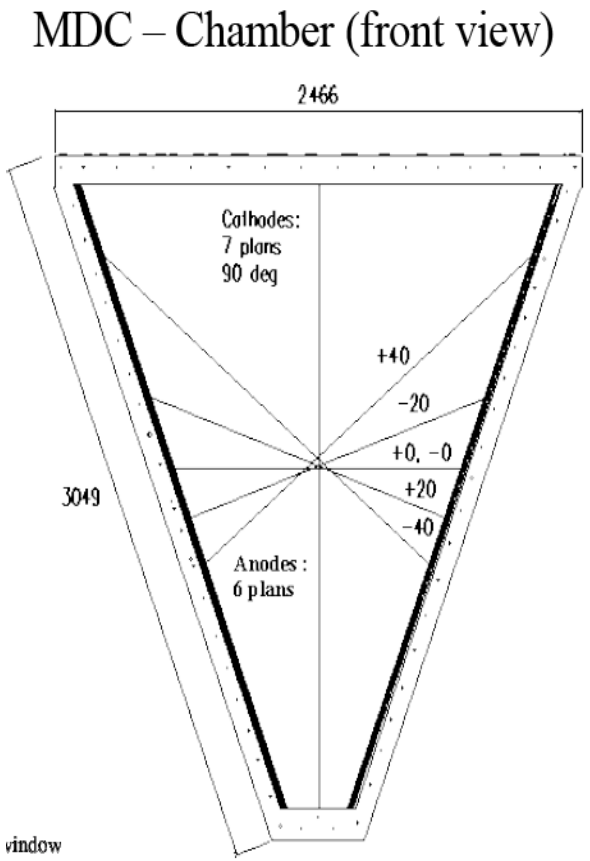
RICH Sub-Detector

HADES Data: CC @ 1 AgeV Aug 04

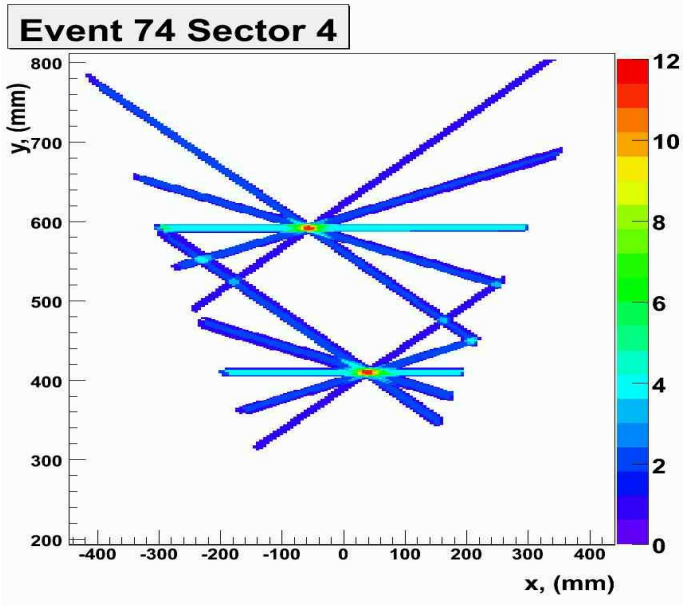


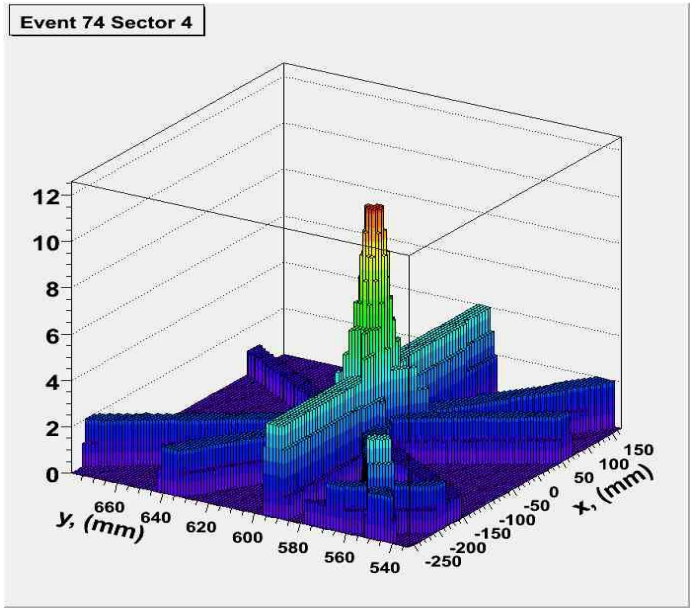
Inner MDC Sub-Detector

MDC Track Finder



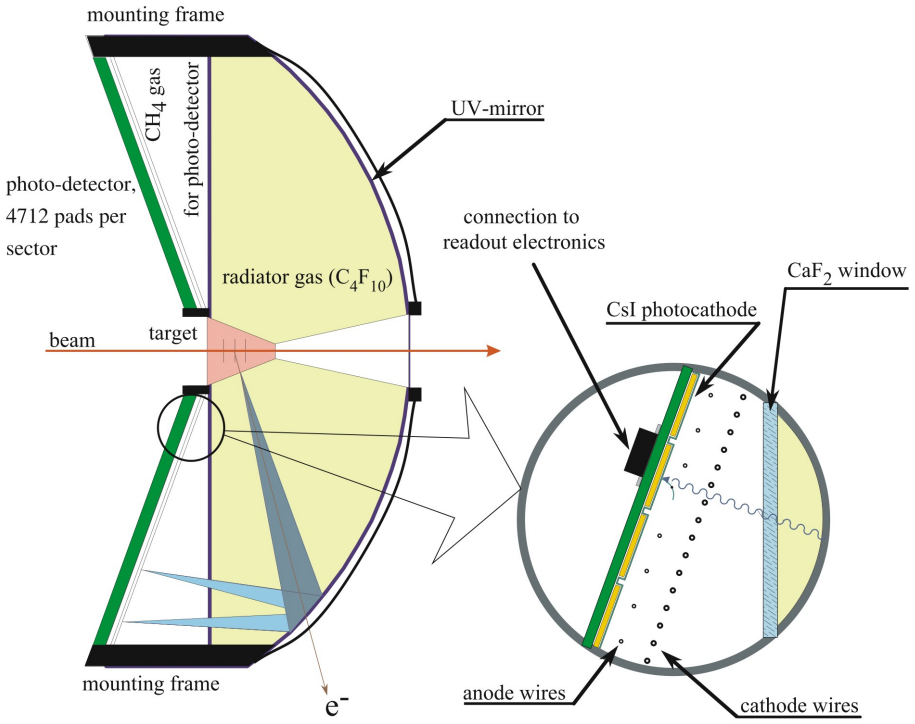
- 6 sectors
- 2110 wires per sector (inner)

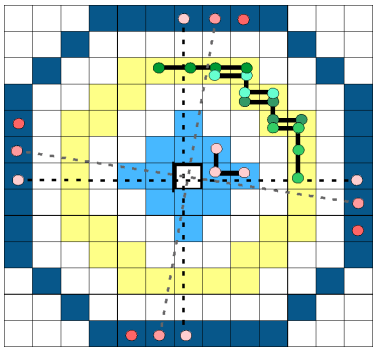




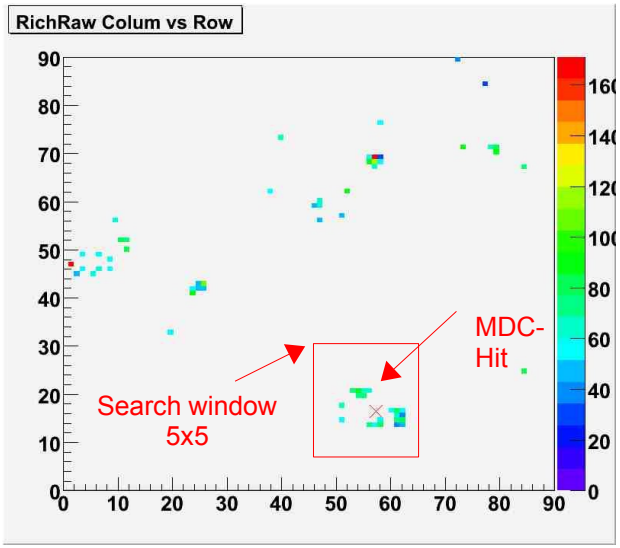
- 4 MDCs
- Straight line tracks from target to inner MDC
- Inner tracks point to RICH and help to find ringpattern
- Implemented in Compute Node by Ming Liu

RICH Ring Finder





- Ring search pattern
- 13X13 pads
- Ringregion
- Inner and outer Veto-regions



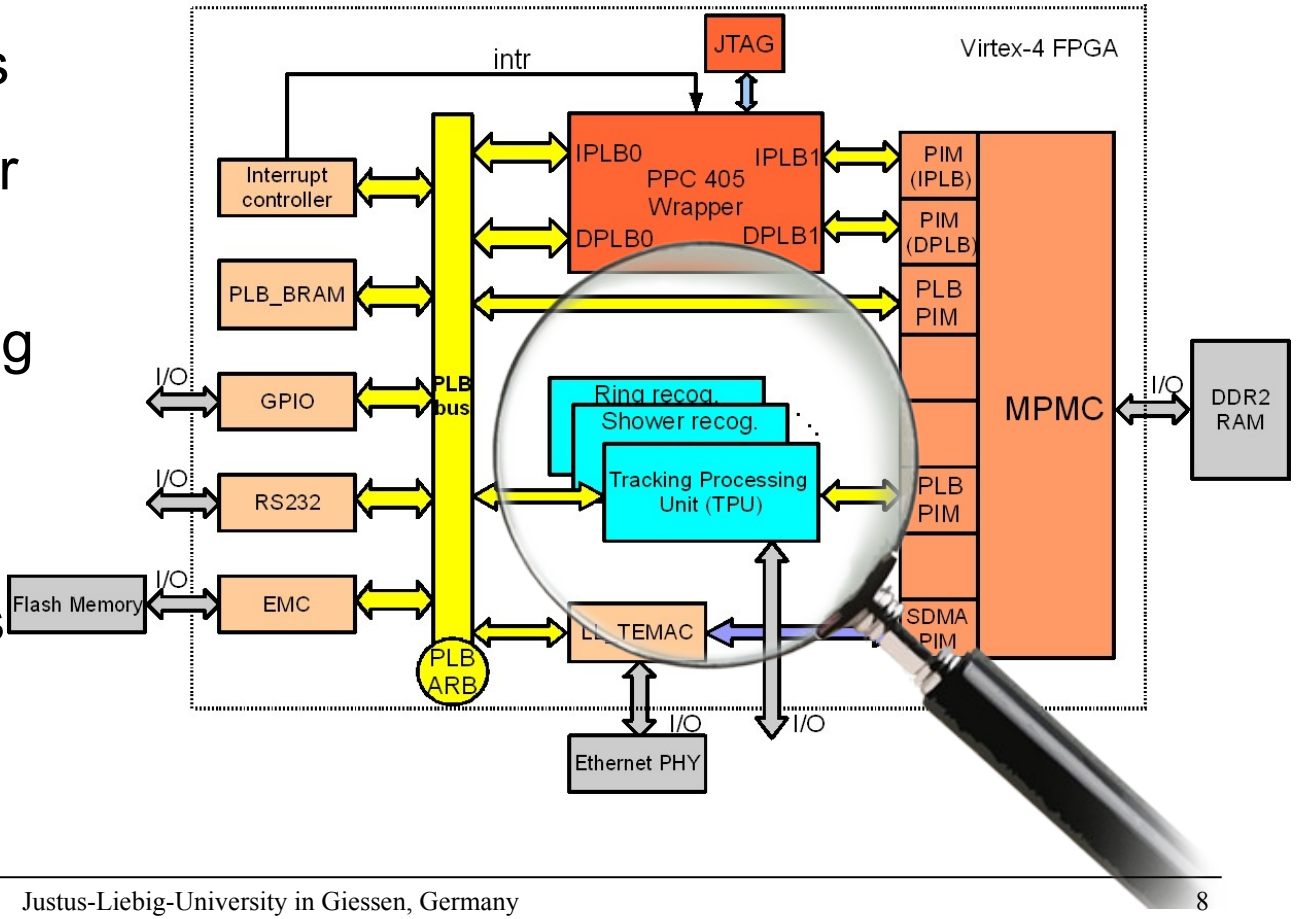
- Mirror reflects Cherenkov light
- 96*96 = 9216 pads/sector
- Pads shaped different
- Hadronblind

- MDC points to a pad
- Smaler searchwindow
- Place mask on each pad in the window
- Every pad in the window can be checked simultaneous

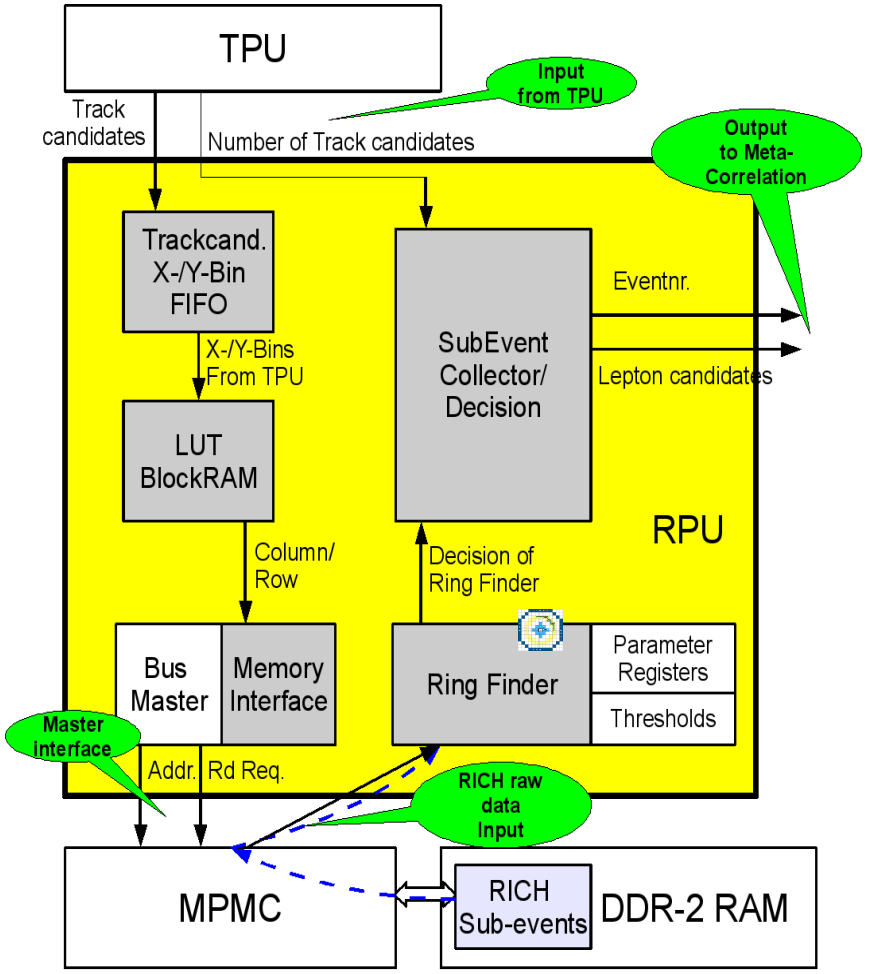
FPGA Design

- peripherals uses only ~22% of FPGA recources
- Most computing power for processing Units
- TPU implemented by Ming Liu

  uses <20% of resources
- Different processing units in one FPGA → direct interconnection



Ring Processing Unit



- To be ported to FPGA (Vertex 4)
- Direct interconnection to Track processing unit and Meta processing unit or Eventbuilder
- RICH raw data bufferd in DDR-2 RAM
- MDC to RICH LUT stored in BlockRAM – maybe DSP-Slices used for calculation
- Many RPUs operate in parallel
- Implementation work in progress

Conclusion

- Online Matching of subdetectors possible and mandatory for future experiments
- Compute Node provides necessary compute power and high bandwith
- PANDA could benefit from the experience made with HADES

Thanks for your attention