

Status of the Bonn R&D Activities for a Pixel Based TPC

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University of Freiburg



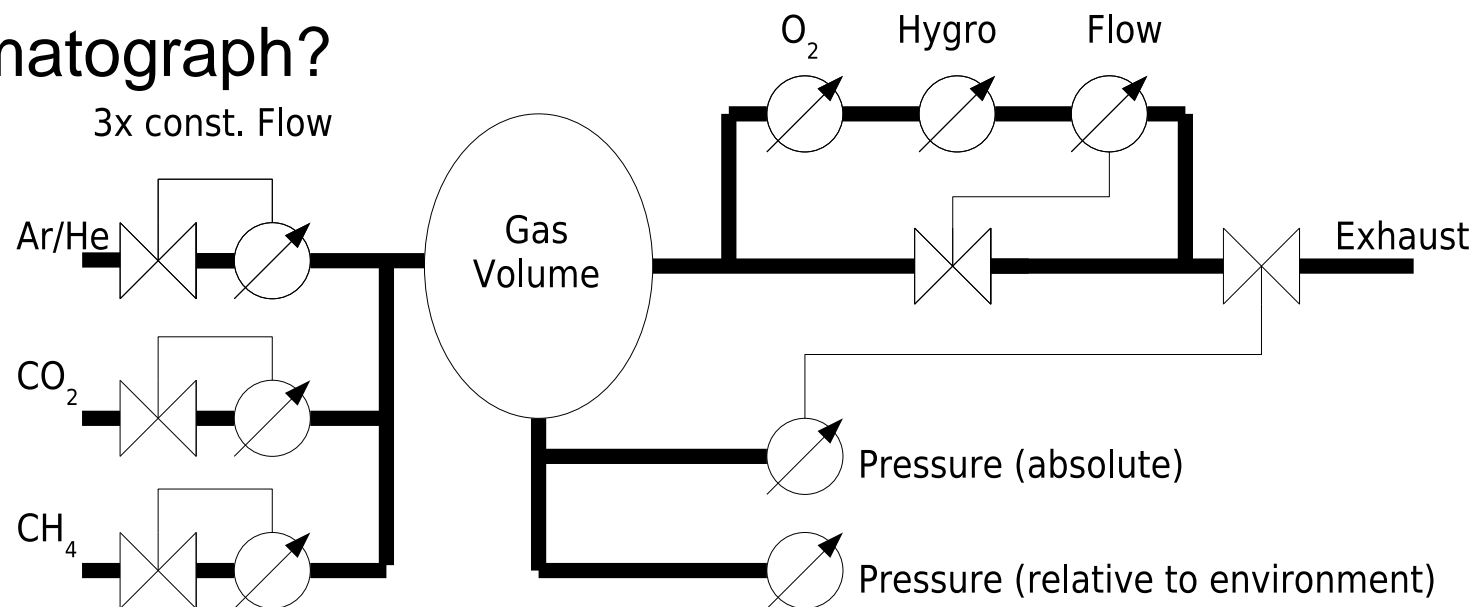
EUDET Annual Meeting 2007, Paris, Palaiseau, October 8, 2007

Currently being set up

- Gas system
- High voltage supply
- Laminar flow box
- Scintillator trigger system
- Small TPC field cage
- Readout electronics
- Hodoscope?

Reuse flow meters and pressure controllers from ZEUS gas system

- Controlled by embedded PC
- Mixing of up to 3 gases
- Allows constant pressure operation
- Oxygen and water monitor
- Gas chromatograph?

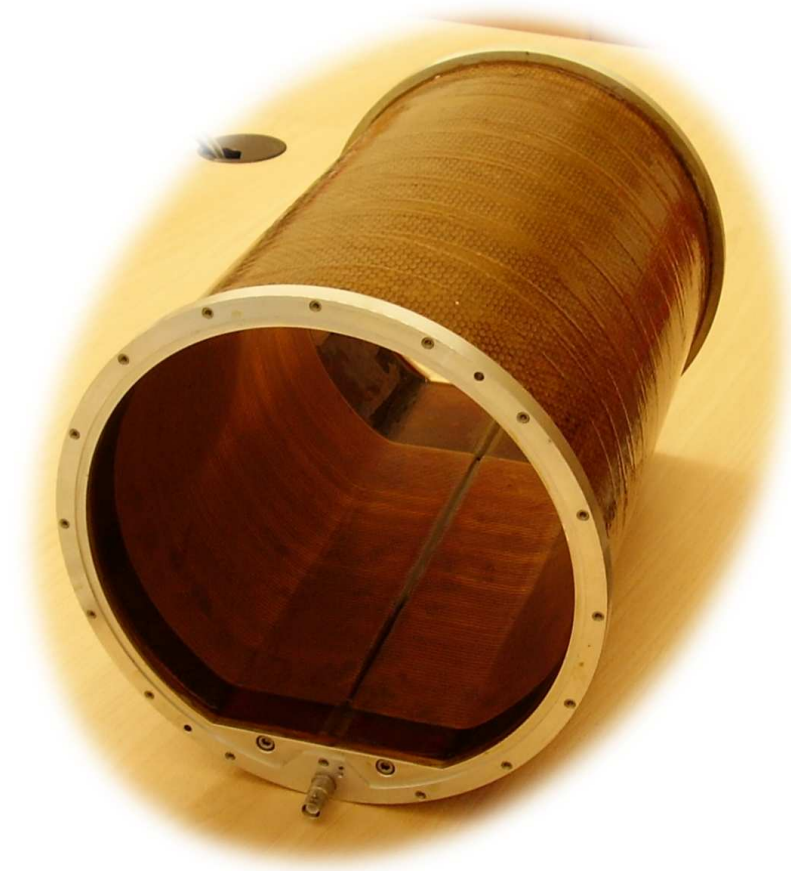


Small TPC Field Cage



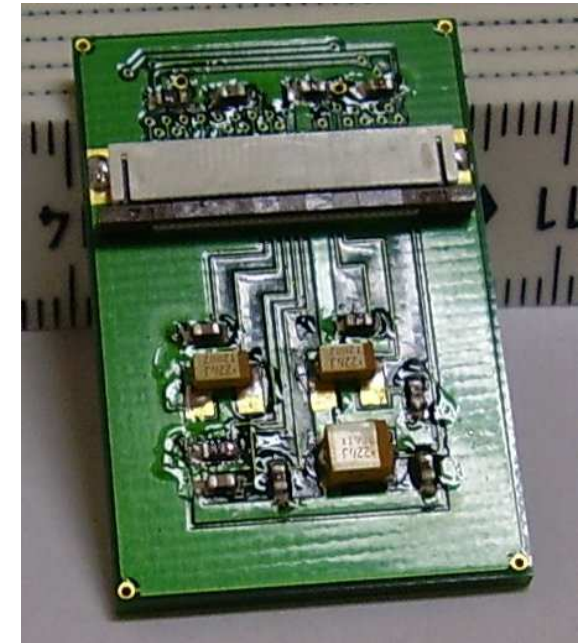
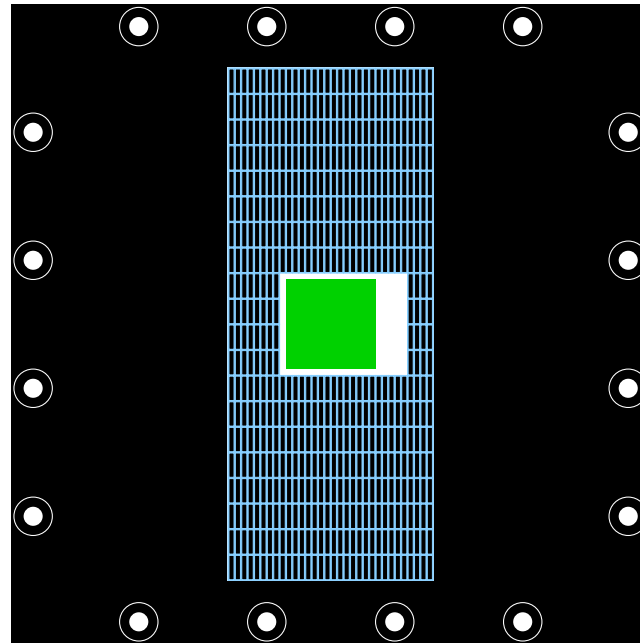
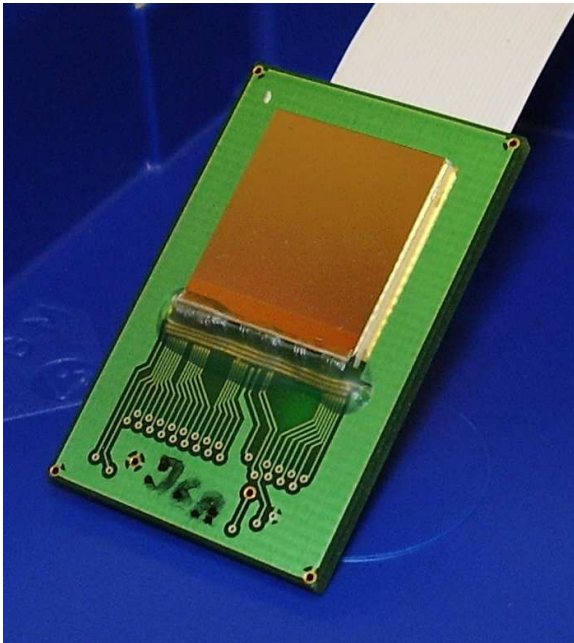
Clone of the Aachen field cage

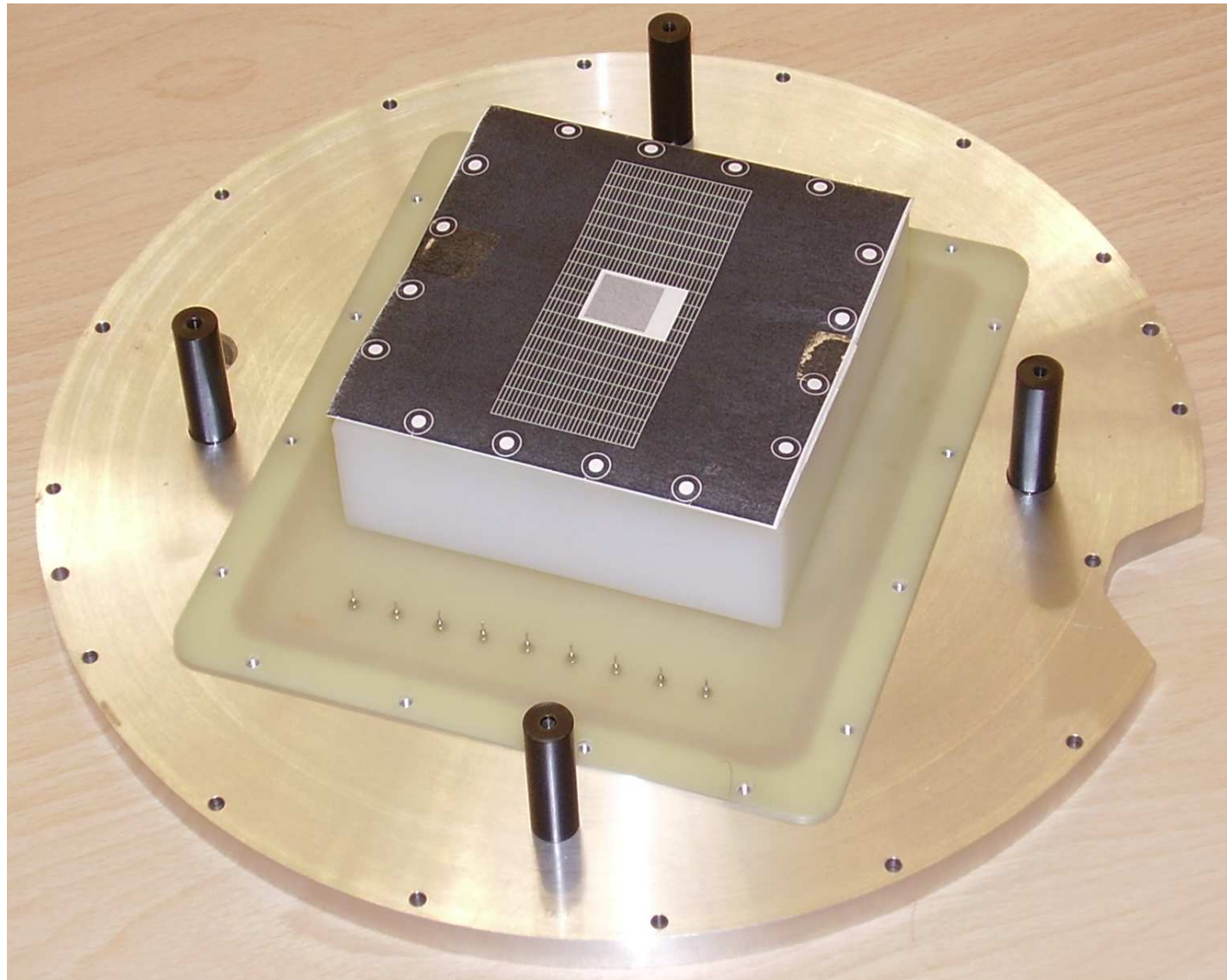
- 26 cm diameter
- 26 cm drift distance
- 3 GEM gas amplification system
- Fits into 5 T magnet at DESY



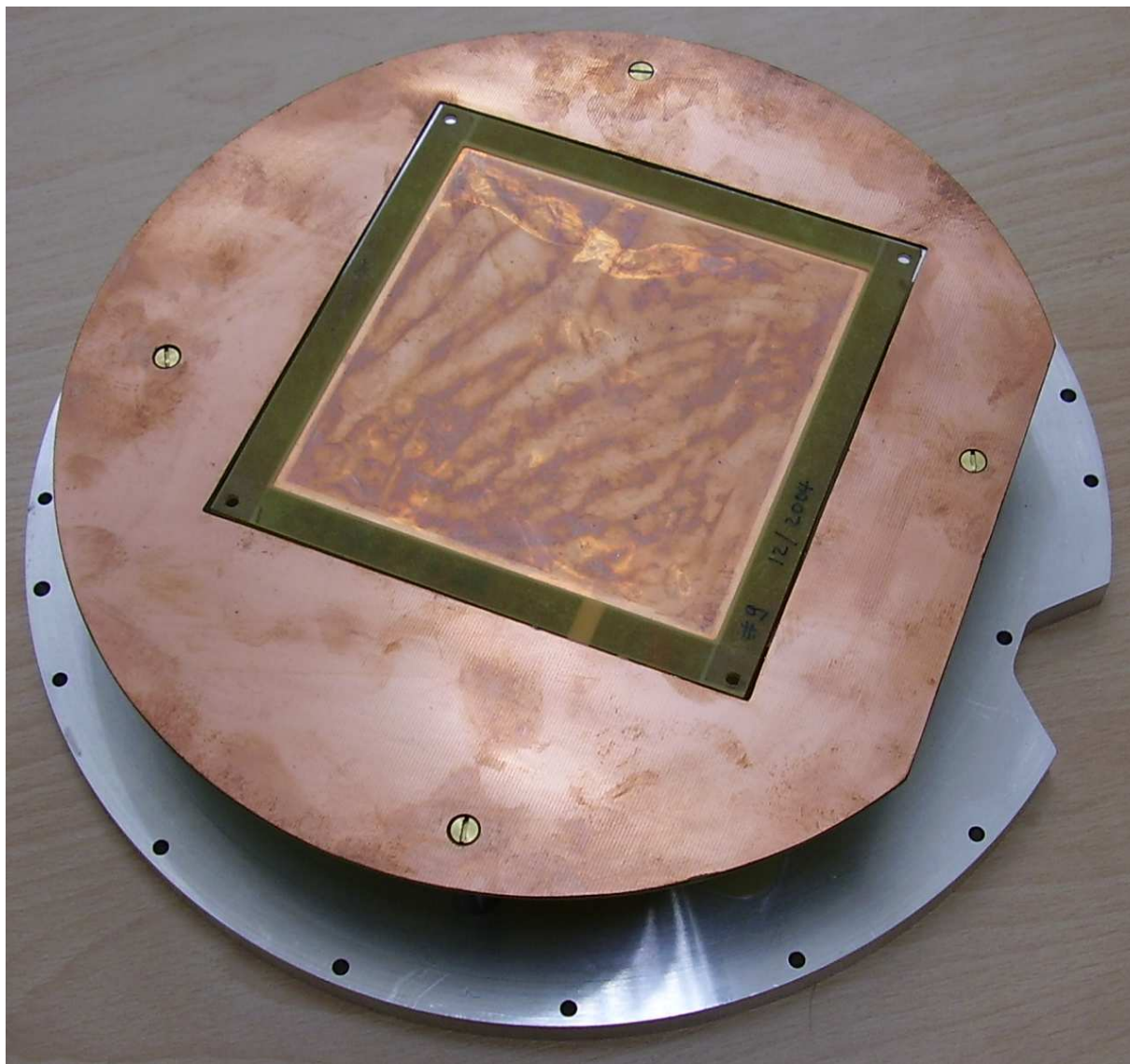
Single Chip Board, based on development from Freiburg

- Designed to be as small as possible:
Resistors mounted behind the chip
- For use in readout plane together with pads





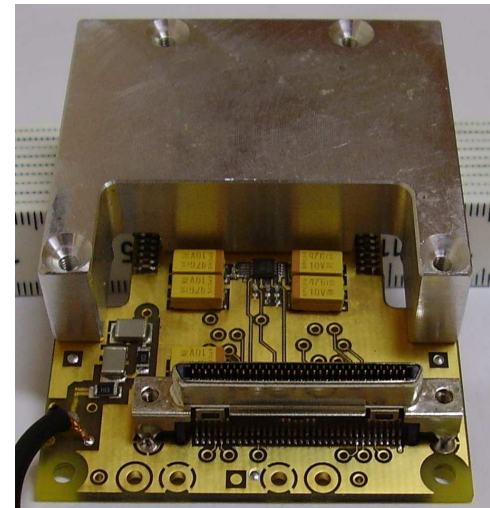
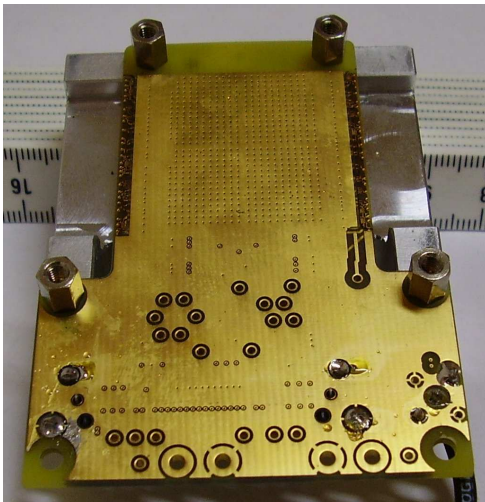
Shield With GEM



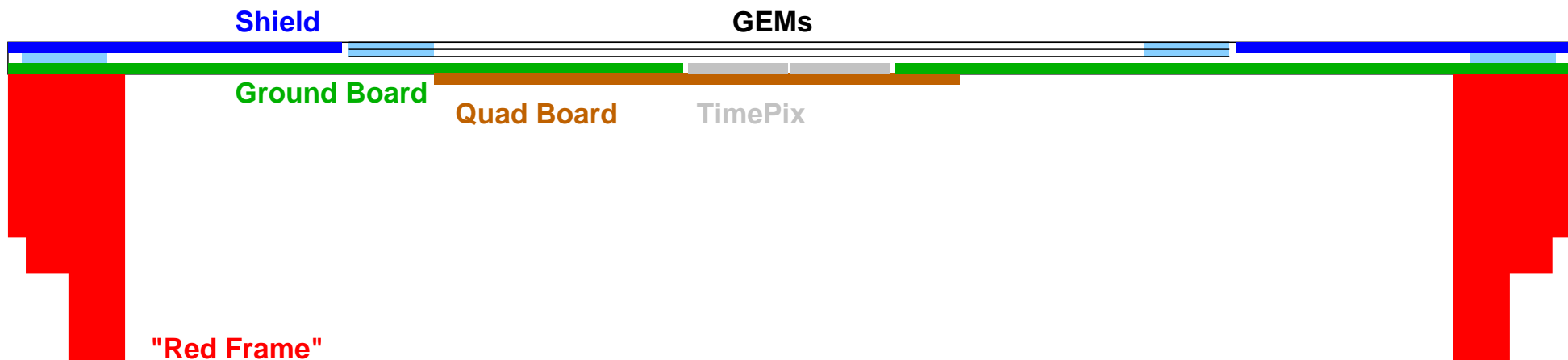
Module for the Large Prototype



- Based on the “Quad Board” designed at NIKHEF
- Two Quad Boards glued into PCB back plane
- Three standard GEMs ($10 \times 10 \text{ cm}^2$) surrounded by shield
- 1 mm gap between the GEMs
- Total height of active detector:
6 mm + connectors / cooling element



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Shield

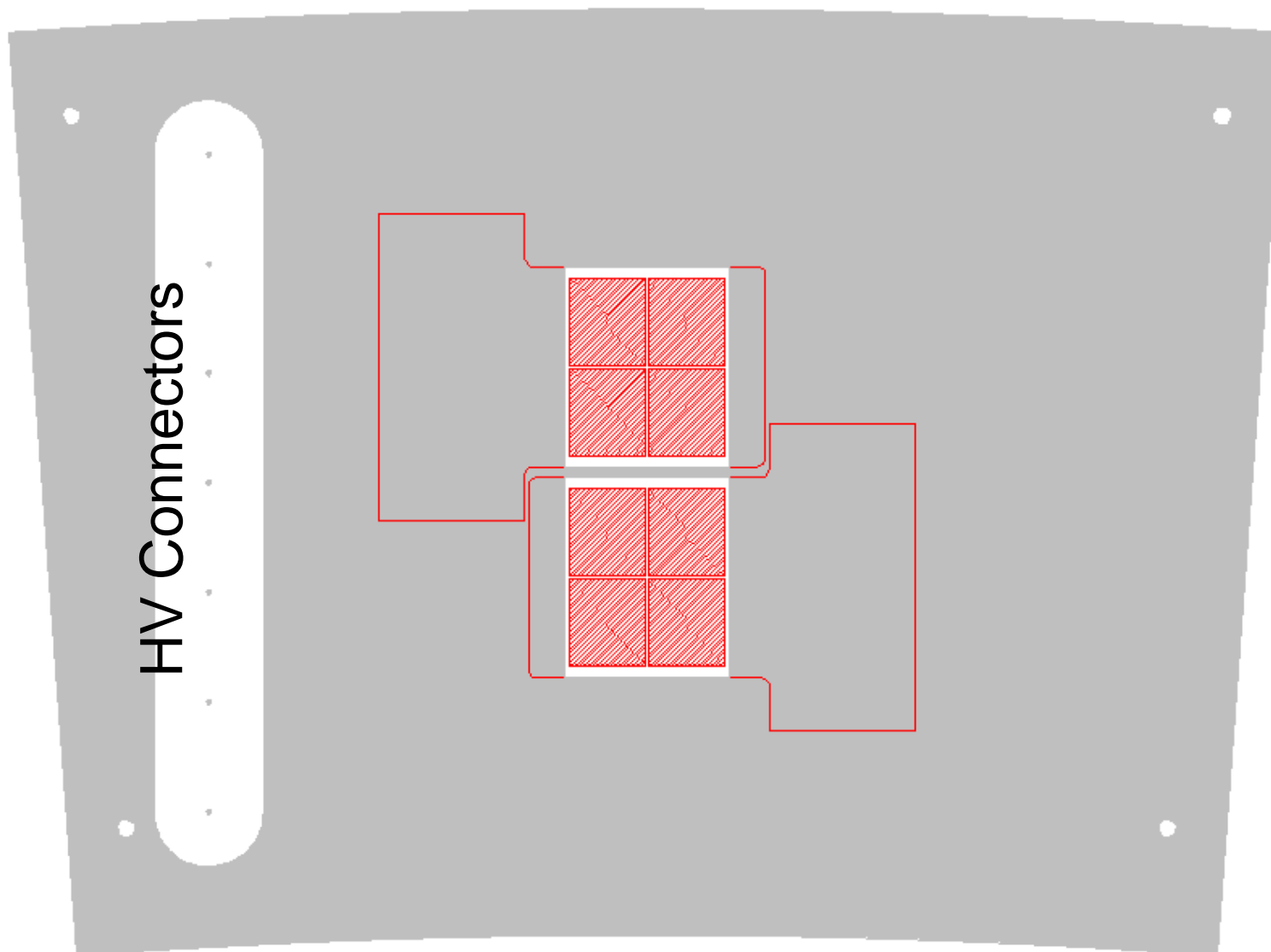
GEMs

Ground Board

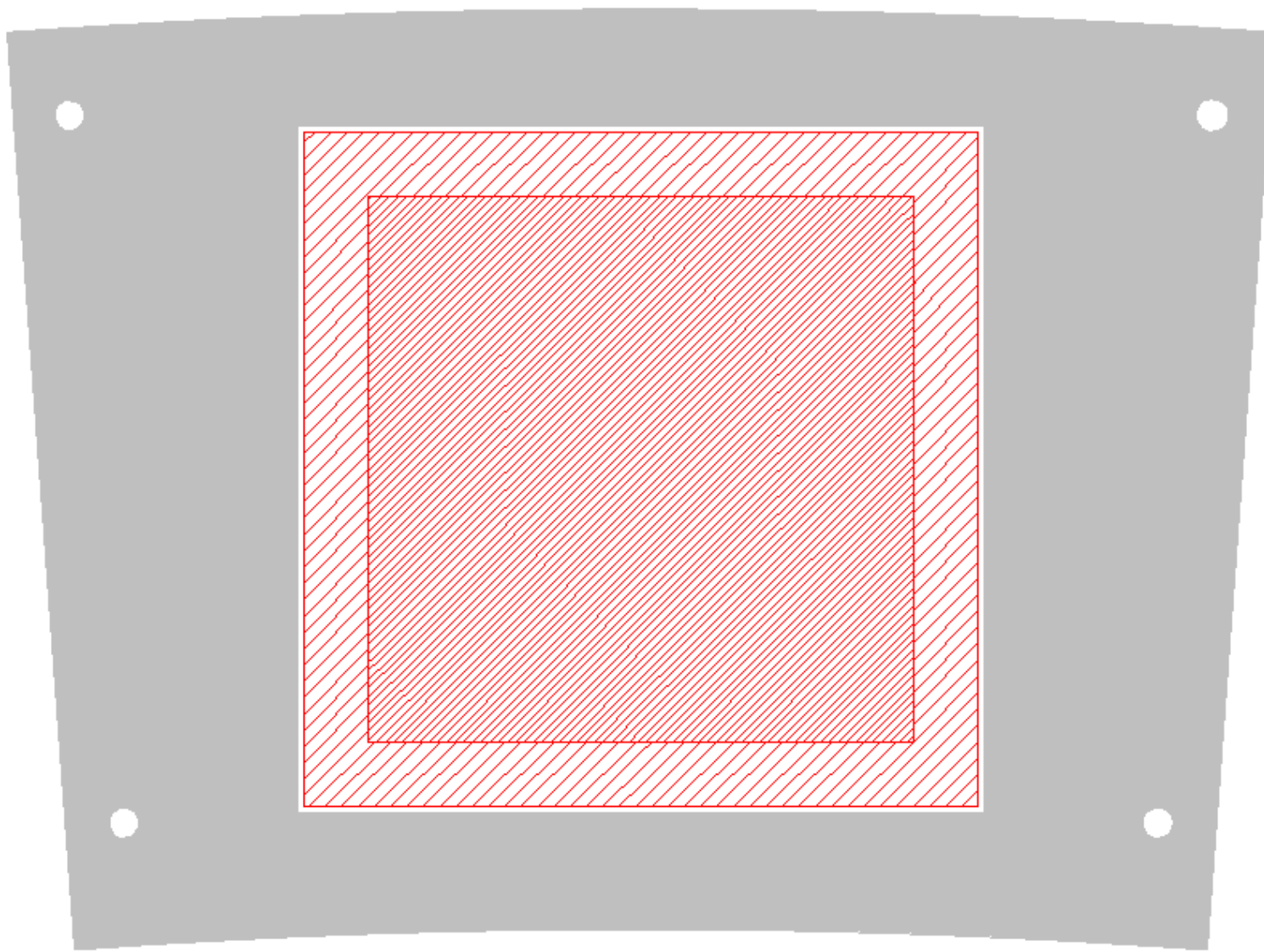
Quad Board

TimePix

Ground Board With TimePixes



Shield With GEM



MarlinTPC is a TPC simulation, digitisation, reconstruction and analysis package for the Marlin / LCIO framework

- Works for prototypes and ILC detectors (every TPC that can be described with GEAR)
- Works for Micromegas, GEMs and anode wires
- Independent of electronics: TDCs, ADCs ...
- Provides standardised analysis to allow better comparability

Latest feature: **Supports reconstruction of TimePix/MediPix data**

- **Raw Data:** TrackerRawData

One entry per chip

- CellID0 = 0
- CellID1 = Chip number
- ADCValues = All raw data from the chip

- **Zero Suppressed Raw Data:** TrackerRawData

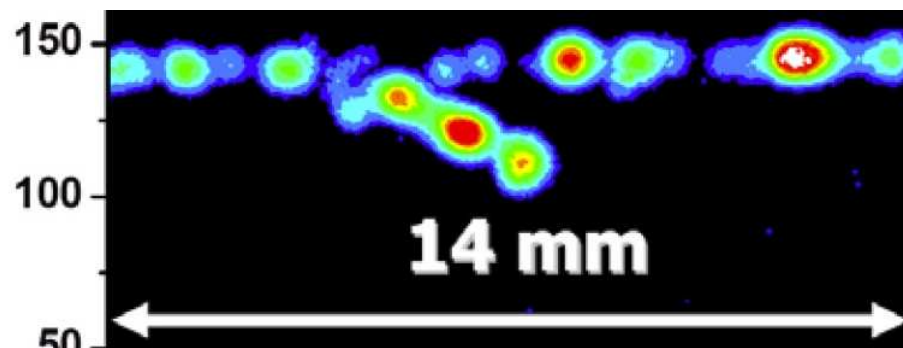
One entry per contiguous area in one row

- CellID0 = First pixel in area
- CellID1 = Chip number
- ADCValues = Raw data of contiguous area

TimePix Reconstruction



Data Structure	Processor Name	Collection Name
<code>TrackerRawData</code>	TimePixZeroSuppressionProcessor	<code>TimePixRawData</code>
<code>TrackerRawData</code>	TimePixClusterFinderProcessor	<code>TimePixZeroSuppressedRawData</code>
<code>TrackerHit</code>	TimePixClusterProjectionSeparatorProcessor	<code>TimePixHitCandidates</code>
<code>TrackerHit</code>	TimePixHitCenterCalculatorProcessor	<code>TimePixSepHitCandidates</code>
<code>TrackerHit</code>		<code>TimePixHits</code>

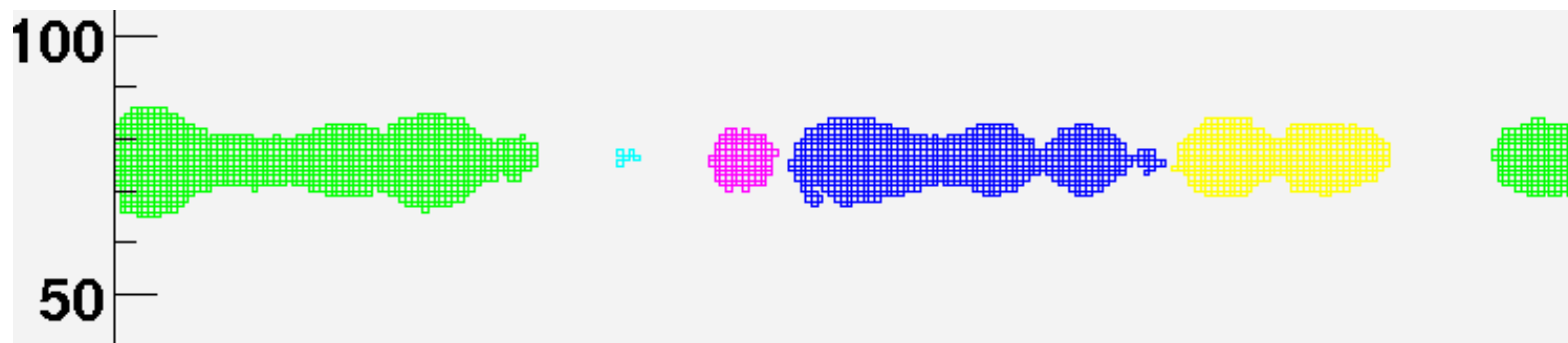


Freiburg test beam data

TimePix Reconstruction



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	TimePixZeroSuppressionProcessor	
TrackerRawData		TimePixZeroSuppressedRawData
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TrackerHit		TimePixSepHitCandidates
	TimePixHitCenterCalculatorProcessor	
TrackerHit		TimePixHits

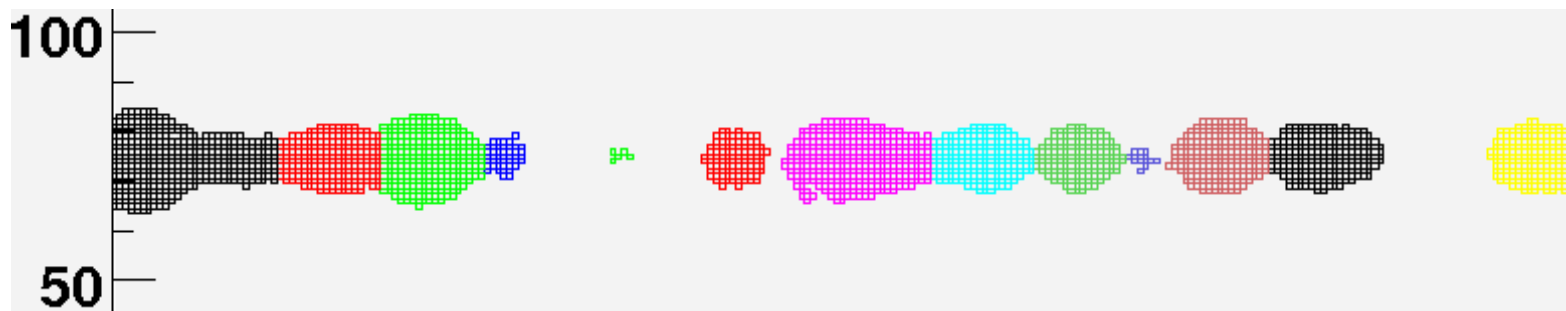


Freiburg test beam data

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	TimePixHitCenterCalculatorProcessor	
TrackerHit		TimePixHits



Freiburg test beam data

- TPC laboratory in Bonn being set up
- Small prototype
 - 3 standard GEMs
 - Combined TimePix and pad readout
 - Can be operated in 5 T magnet at DESY
- LP module
 - 3 standard GEMs
 - 8 TimePix Chips
- MarlinTPC software package supports reconstruction of TimePix/MediPix data