Status of the R&D at DESY/University of Hamburg

Video Conference, October 15, 2002

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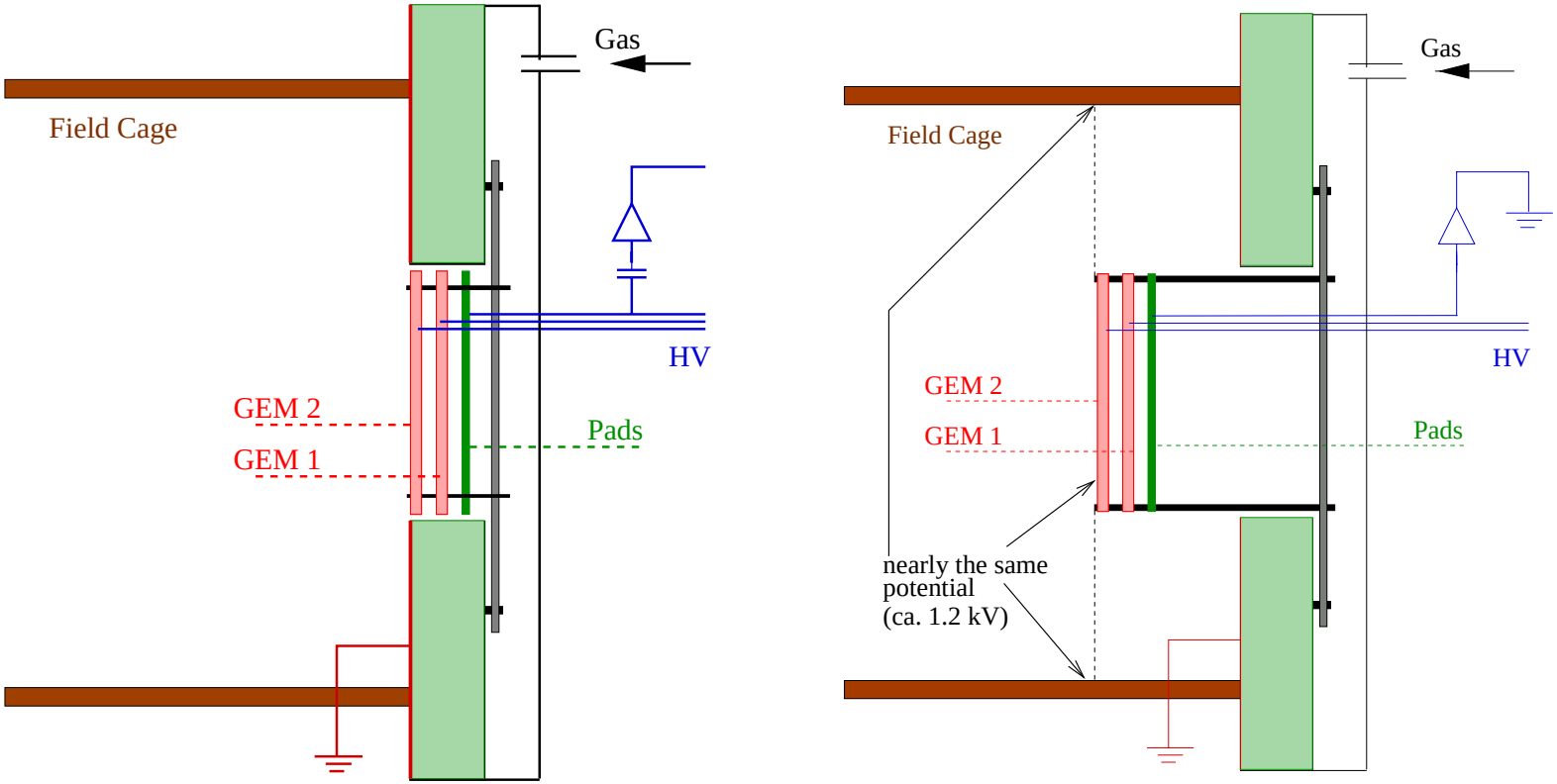
- **Big TPC**
- **New Prototype**
- **Mini TPC**
- **Experimental Environment**
- **Simulation**

Big TPC

- setup of the endplate changed (see figures): now pads on potential 0
- stable data taking since 4 days
- we still see sparks, but they have not destroyed our GEMs
- short term measurement programme (before Prag ?)
  - long data taking period with correction for atmospheric pressure
  - repeat point resolution measurements of rectangular and chevron pads with different GEM tower geometries
- test beam measurements $\rightarrow$ two track resolution ?

Big TPC

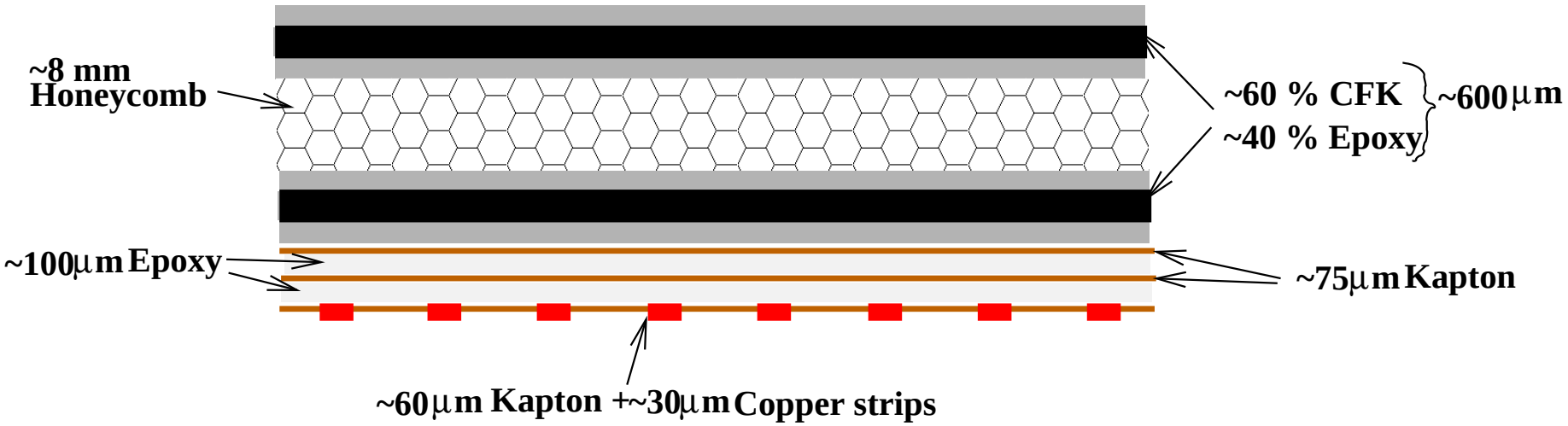

Gas
Field Cage
HV
GEM 2
GEM 1
Pads
Gas
Field Cage
HV
GEM 2
GEM 1
Pads
nearly the same
potential
(ca. 1.2 kV)

New TPC Prototype

(for the operation in the 5 T magnet)

- development of a field cage sandwich structure (K. Gadow), see sketch
- high voltage tests (up to 20 kV) for a first sample done
- further HV tests with more realistic sample (including resistor chain) in the next days
- glueing tests ongoing
- resistor chain has been mounted on the TPC capton foil one week ago
- design of endplate ready, cathode design still not final

New TPC Prototype



Mini TPC

(for ion feedback measuremets)

- technical problems of the DAQ solved: The full potential of OPAL nA meter can be exploited
- systematic measurement of the $E \times B$ effect:
  rotate chamber inside the 1 T magnet
- plan: build another smaller mini TPC which fits inside the 5 T magnet

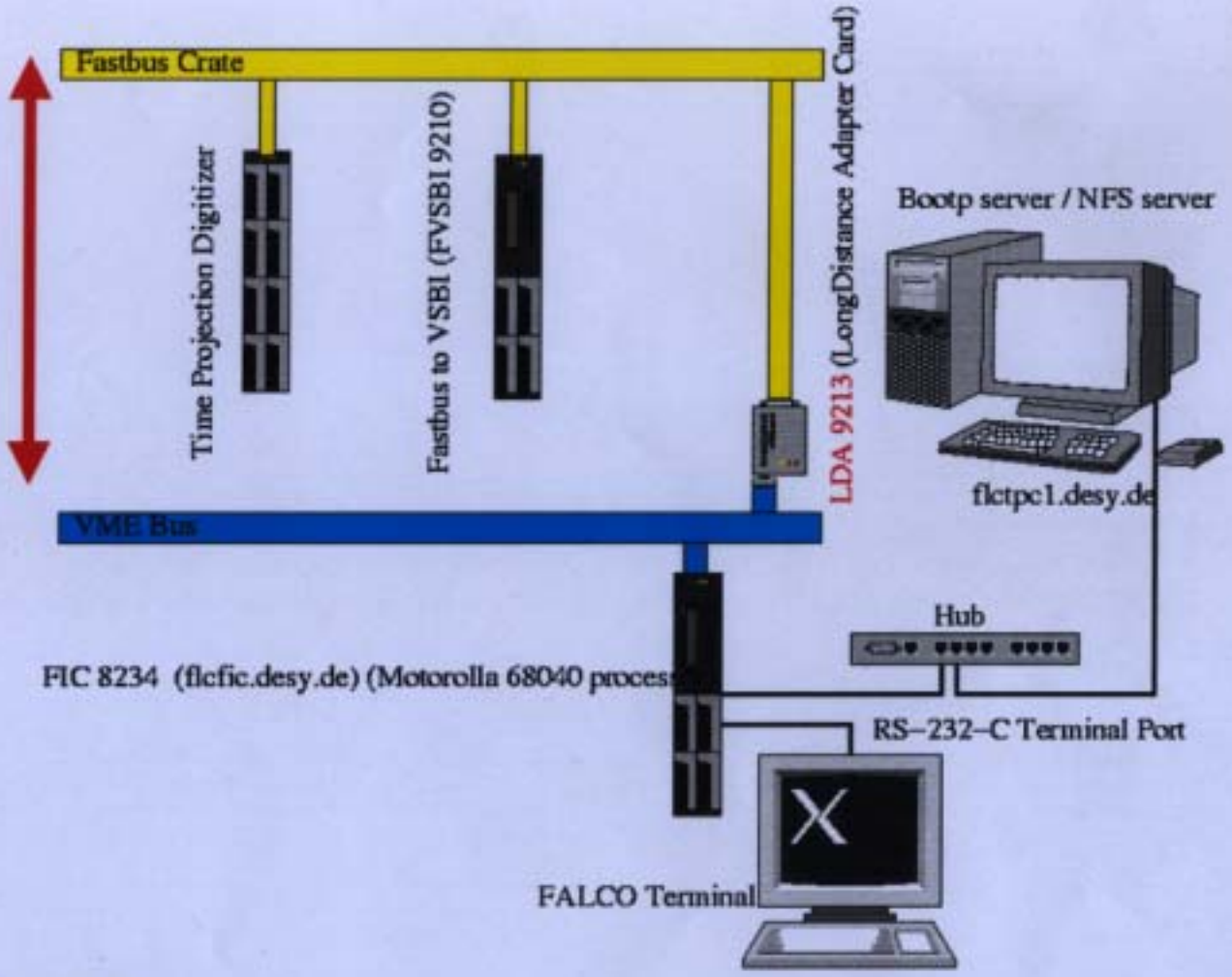
Experimental Environment

- **5 T magnet**
  - vacuum system, instrumentation completed
  - power supply will be ready in approx. one week
  - high pressure test under way
  - connection to electricity still missing
  - new time estimate for start of operation: before christmas

Experimental Environment

- **Laser**
  - we have selected a laser
  - in 2 weeks: YAG laser for testing properties and induced noise
- **DAQ**
  - ongoing effort to get to run the Aleph VME DAQ (see sketch)
  - Could we get a Fastbus clock module from somewhere ?

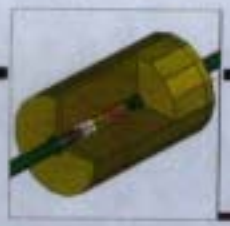
To be figured out



- **Hardware setup ready**
- **Problems to compile basic codes (ANSI C compatibilty)**
- **need of a CLOCK-Fastbus module**

Simulation

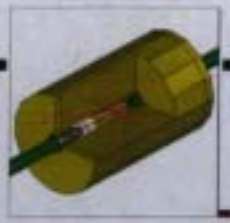
- Difference between Dean's and TK simulations understood:
  - different simulation tools
  - different gases
  - different readout geometry
  - different reconstruction tools (pad response function)
  - different resolutions (resiuduals vs d0 track resolution)
  - different number of tracking points → 5 points (Dean) vs 20-200 points, TDR: d0 resolution is better for squares using 5-10 fitting rows and setup for Chevrons using large number of rows
- What I learned:
  - Use variable independent of fit or use condition similar to Tesla: Measured pad response function, fit with more than 20 rows
  - tools do not make big differences (Magboltz/Heed and Polya distribution only slow down the program)



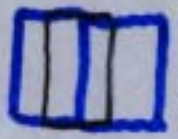
Simulation (Conclusion)

Two main items:

- diffusion in drift volume → Gas
  - two times better resolution with CF_4 than TDR gas
    → ??? have to prove if we can run stable ???
- accuracy of readout system
  - Prediffusion gap
    * diffusion at E ≈ 2000 V/cm
      → only small dependence on gas (550-700$\mu m/\sqrt{cm}$)
    * 1 cm should be enought for 30 cm drift lenght
    * 3-4 cm should be ideal: best resolution for all gases, all drift distances without pad response function and for squares and chevrons → ??? check stable running (we can do it for 2 cm)
  - pad size/geometrie (chevrons vs. squares)
    * chevrons → smaller prediffusion gap needed



Pad response function



$\frac{R}{L+R}$

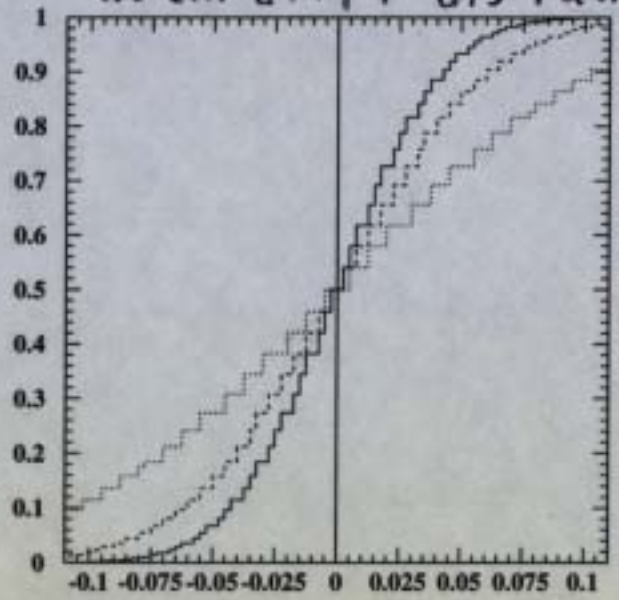
3. dependence of gas and diffusion gap

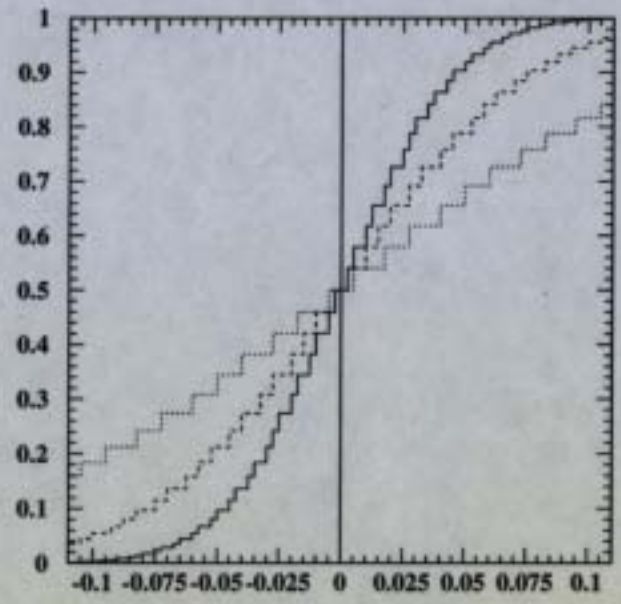
Tesla (TDR) Gas

10 cm drift distance

Ar 98 CF_4 2

L R





— 0.2 cm drift gap

--- 1 cm gap

.... 4 cm gap

2x 6mm² pads