

MPI TPC Prototype, "Wheel Studies"...

by Ron Settles, MPI/DESY

for the MPI, DESY, ASIAN, IPN Orsay groups
listed on next slide

...plus a few words about "Si-readout" discussion
(see talk by Jan Timmermans)

MPI TPC Prototype Activities

MPI, DESY, ASIAN, IPN Orsay groups:

MPI

Tscharlie Ackermann, Helmut Schendzielorz, Heinrich Keppeler, et al
Volker Eckardt, Peter Maierbeck, Ron Settles

DESY

Markus Ball, Markus Hamann, Thorsten Kuhl, Thorsten Lux, Peter
Wienemann, et al

ASIA

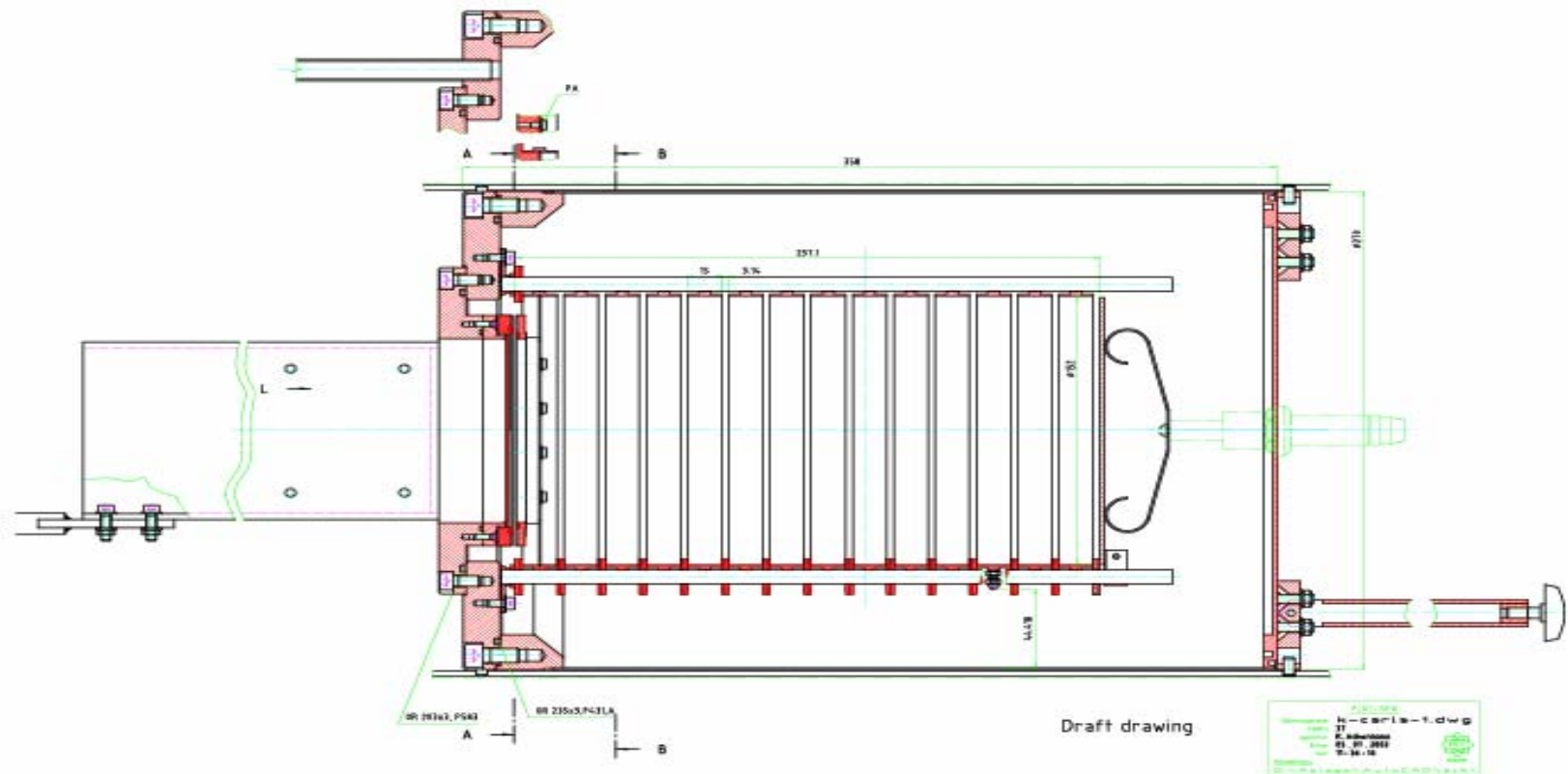
Keisuke Fujii, Makoto Kobayashi, Takeshi Matsuda, Osamu Nito, Tohru
Takahashi, et al

IPN Orsay

Joel Pouthas, Philippe Rosier, Vincent Lepeltier et al

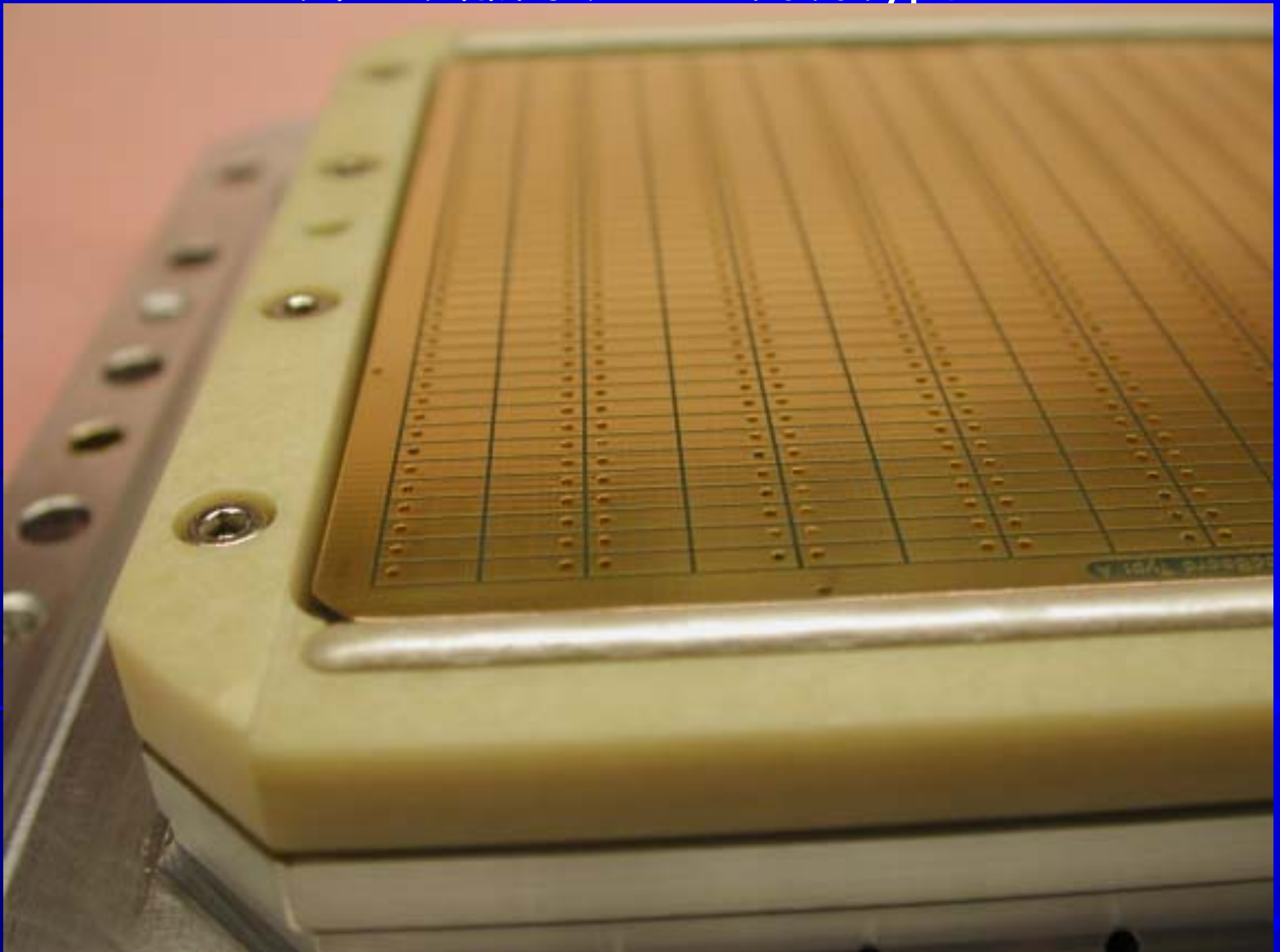
MPI-Munich prototype for Wires, Gem or Micromegas test in 5T magnet at DESY

Wire version ready, Gem version in preparation

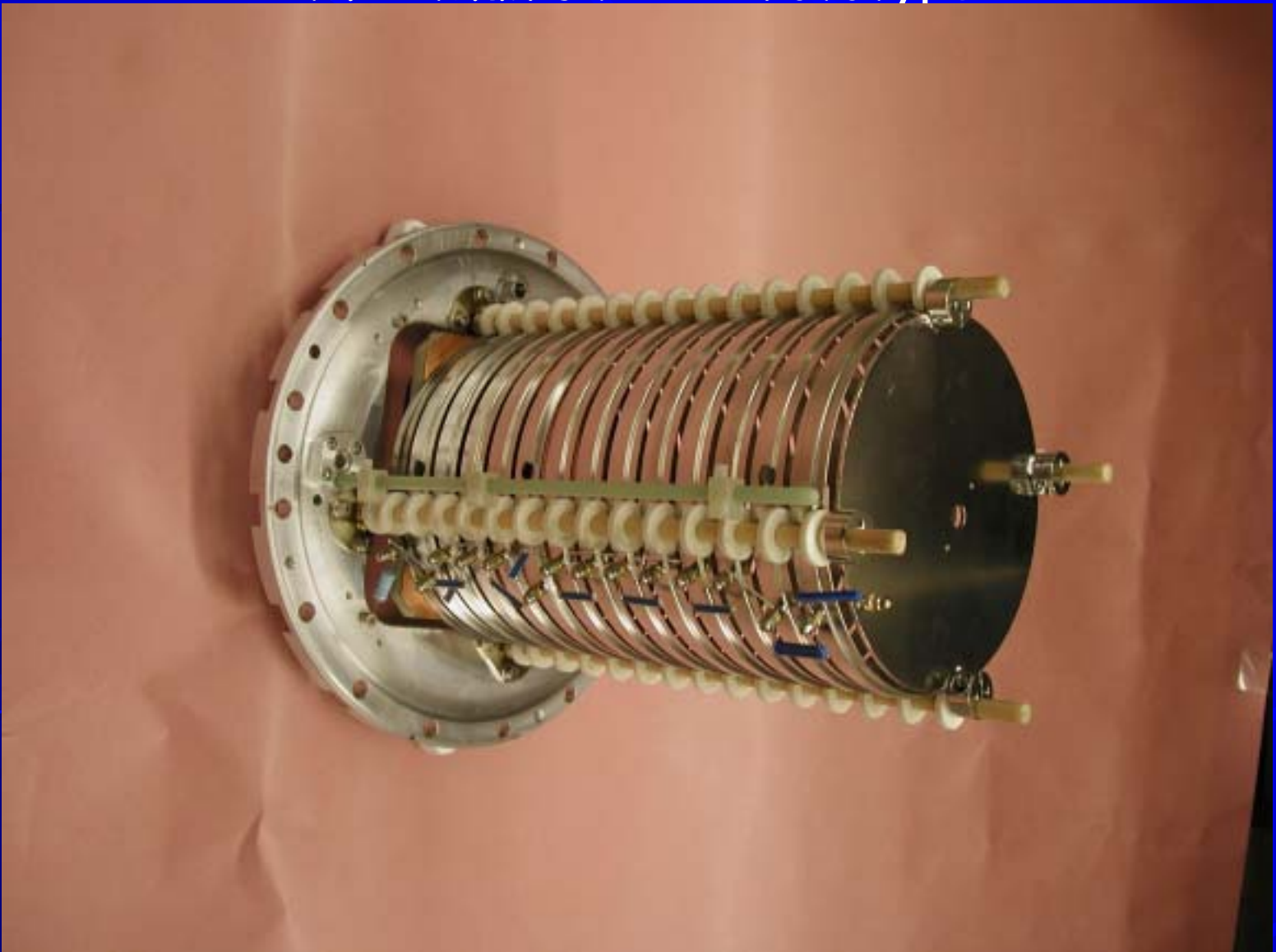


- Pad plane 100mm x 100mm
 - Pad size 2mm x 6mm
- 12 of 16 rows (384 pads) instrumentable
- Wire spacing 2mm (without fieldwires)
- Pad-wire distance 1mm ($\sigma_{PRF} \sim 1.4\text{mm}$, in principle -> to be measured)
- No gating plane for the moment

MPI-Munich TPC Prototype



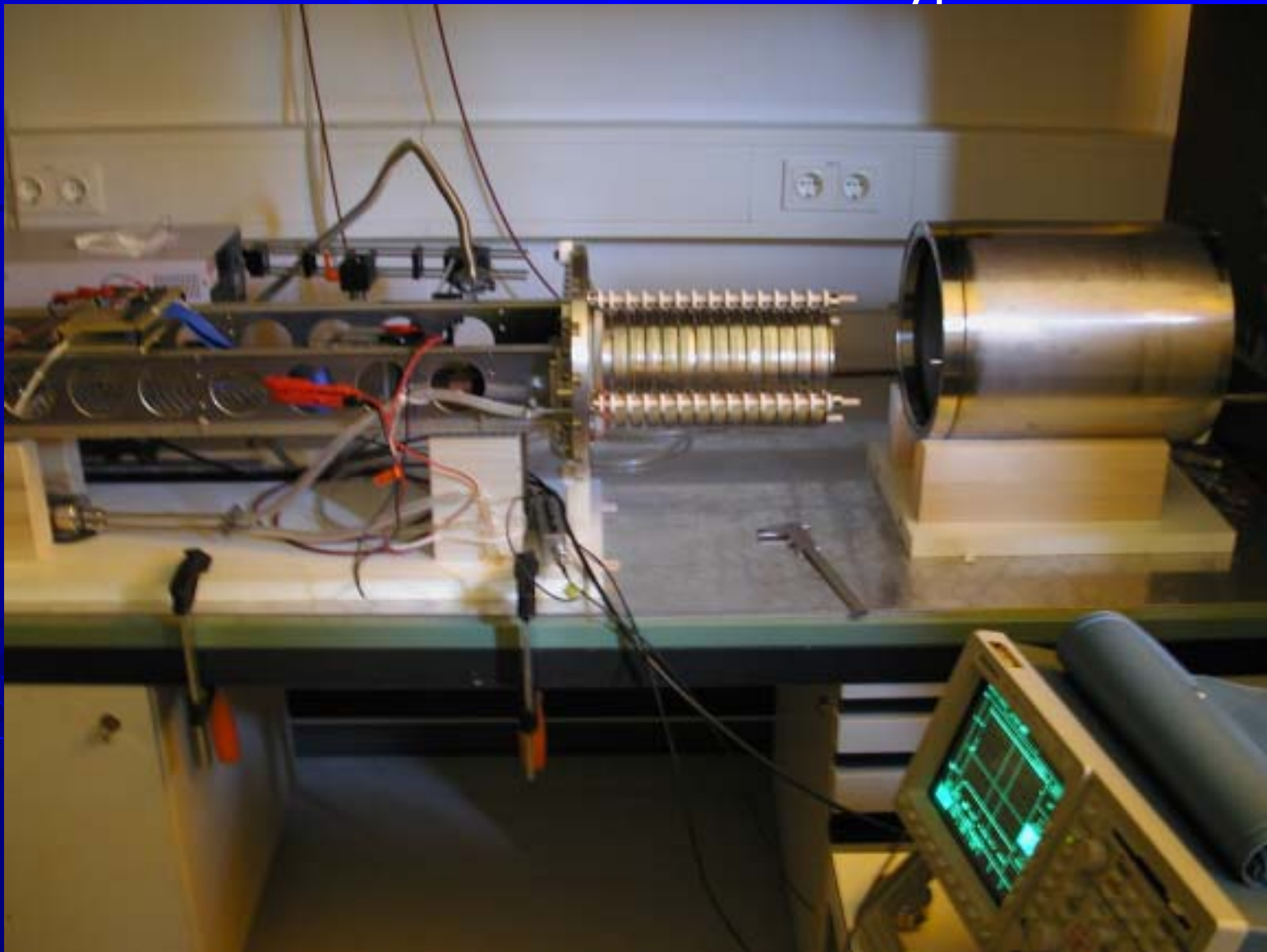
MPI-Munich TPC Prototype



MPI-Munich TPC Prototype



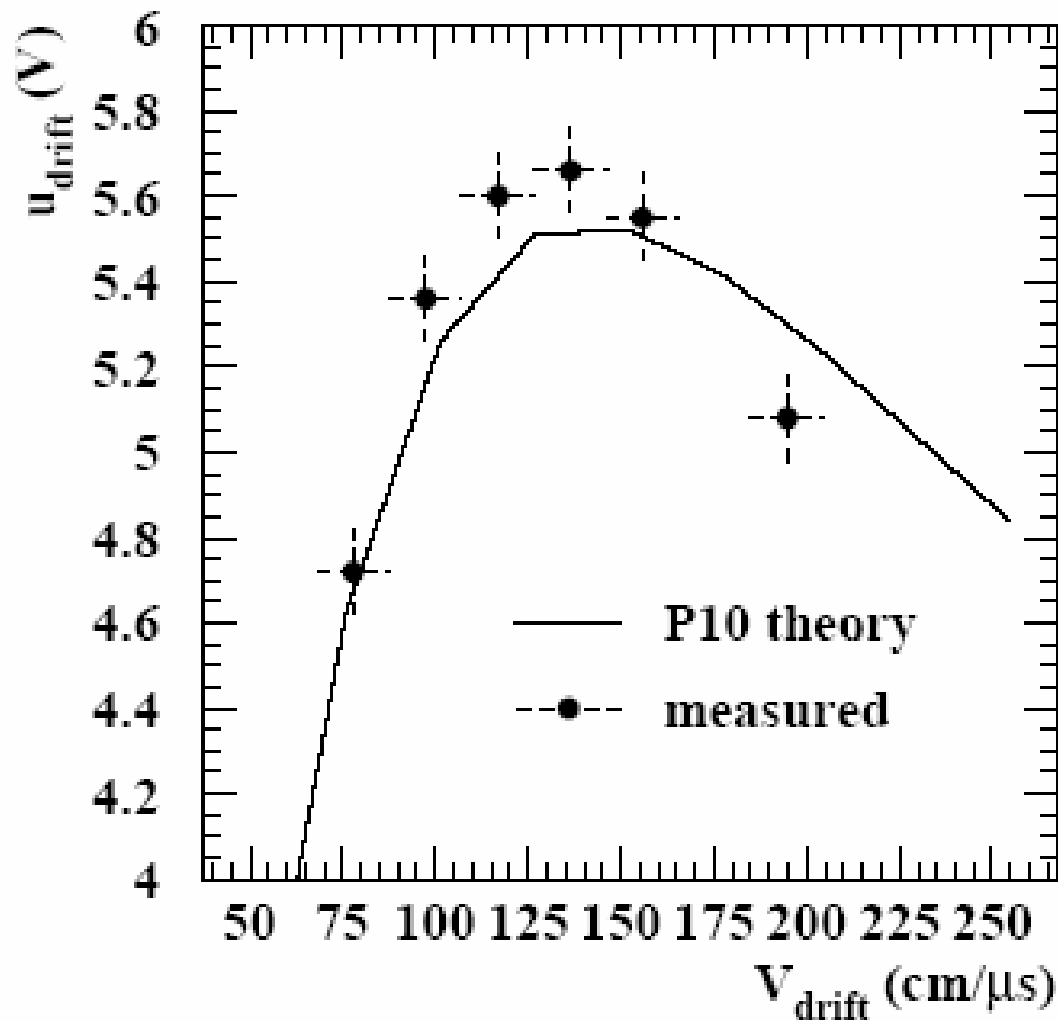
MPI-Munich TPC Prototype



2004 April 21

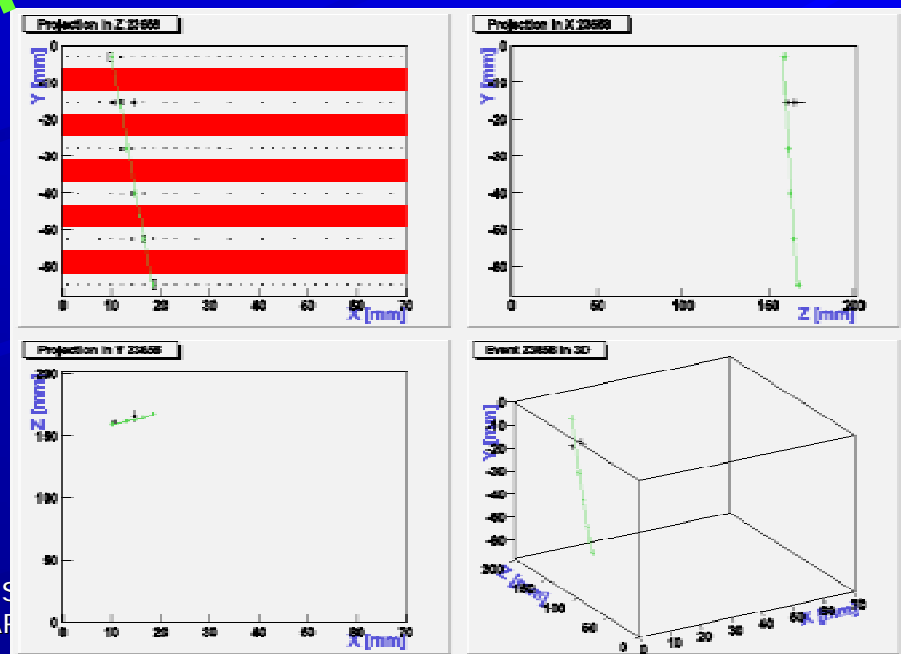
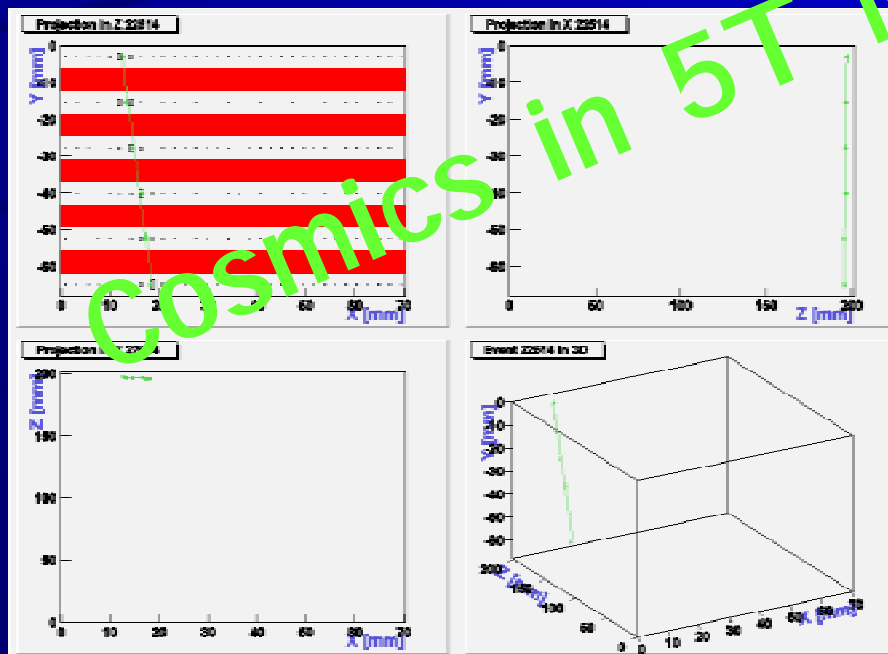
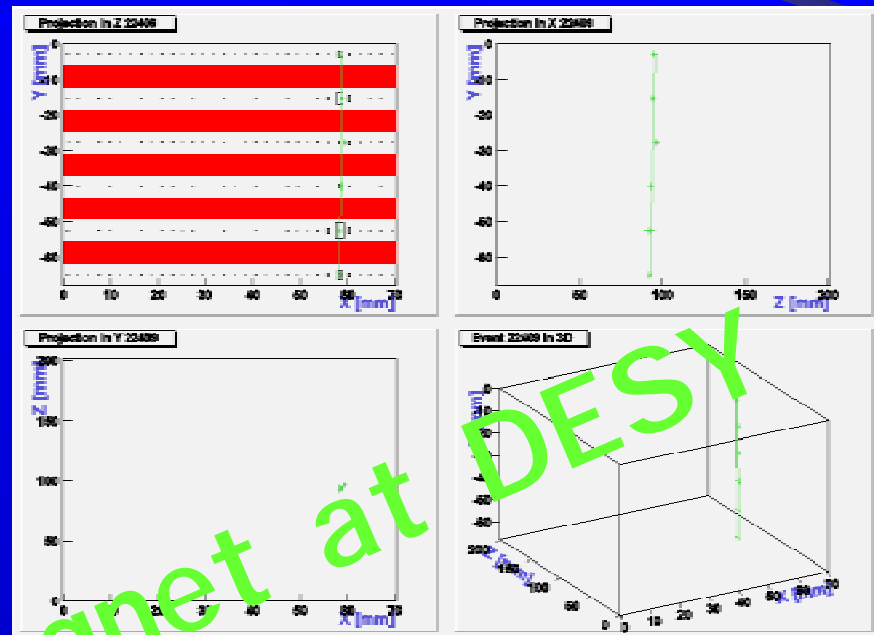
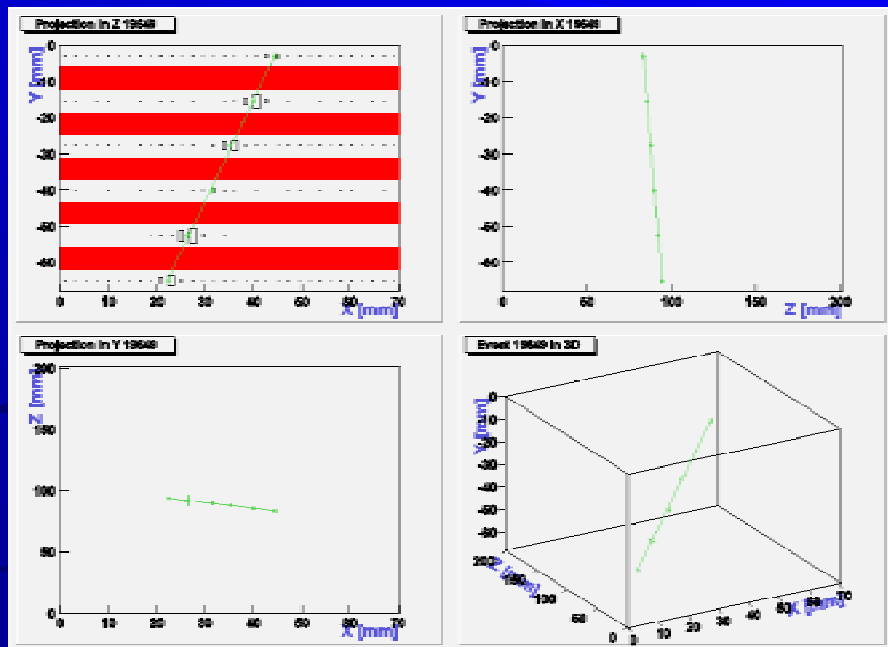
Ron Settles-Tracking Session-LCWS 2004
@ PARIS

MPI-Munich TPC Prototype - first tests



Some of the steps...

- First tests “by hand” (previous slide)
- Wire connection pad \leftrightarrow preamp replaced original flexible circuits
- Connectors adapted for Aleph preamps
- Final tests at MPI end Feb \rightarrow sent to Desy
- Test for ~ 2 months \rightarrow send to KEK



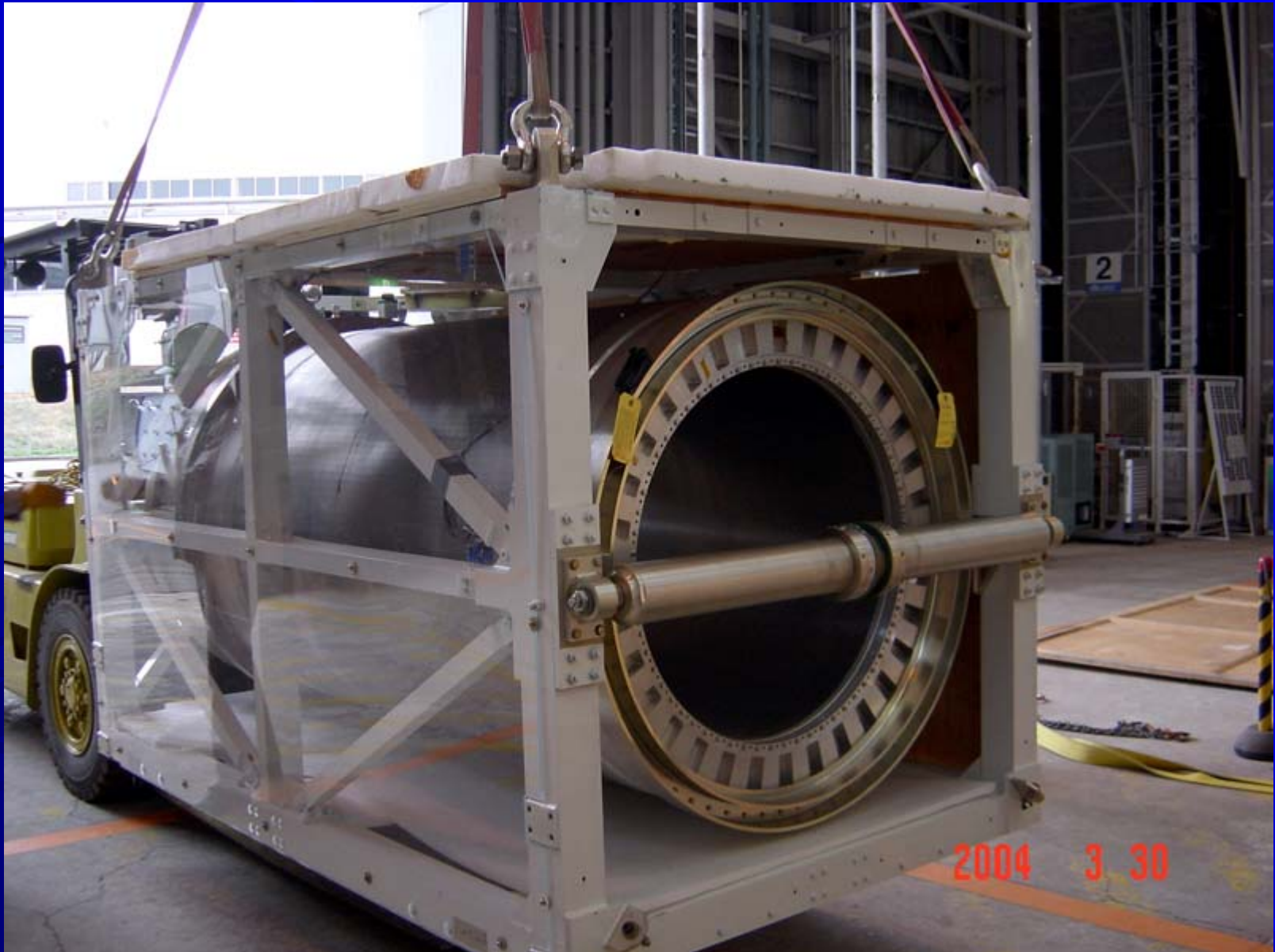
Planning with Asian Colleagues

Video meetings every 2 weeks

8-9 March
10-28 March
31 March-2 April
12-18 April
18-21 March & 14-17 April
Early May
May-June

VE transports MPI TPC to Desy
Set up and test MPI TPC at Desy
MPI chamber working—cosmics taken
Test in 5T magnet at DESY
Keisuke Fujii & Osamu Nito at Desy
Ship MPI TPC + electronics to KEK
Set up at KEK, test in magnet/beam

JACEE magnet at KEK



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Studies with IPN Orsay

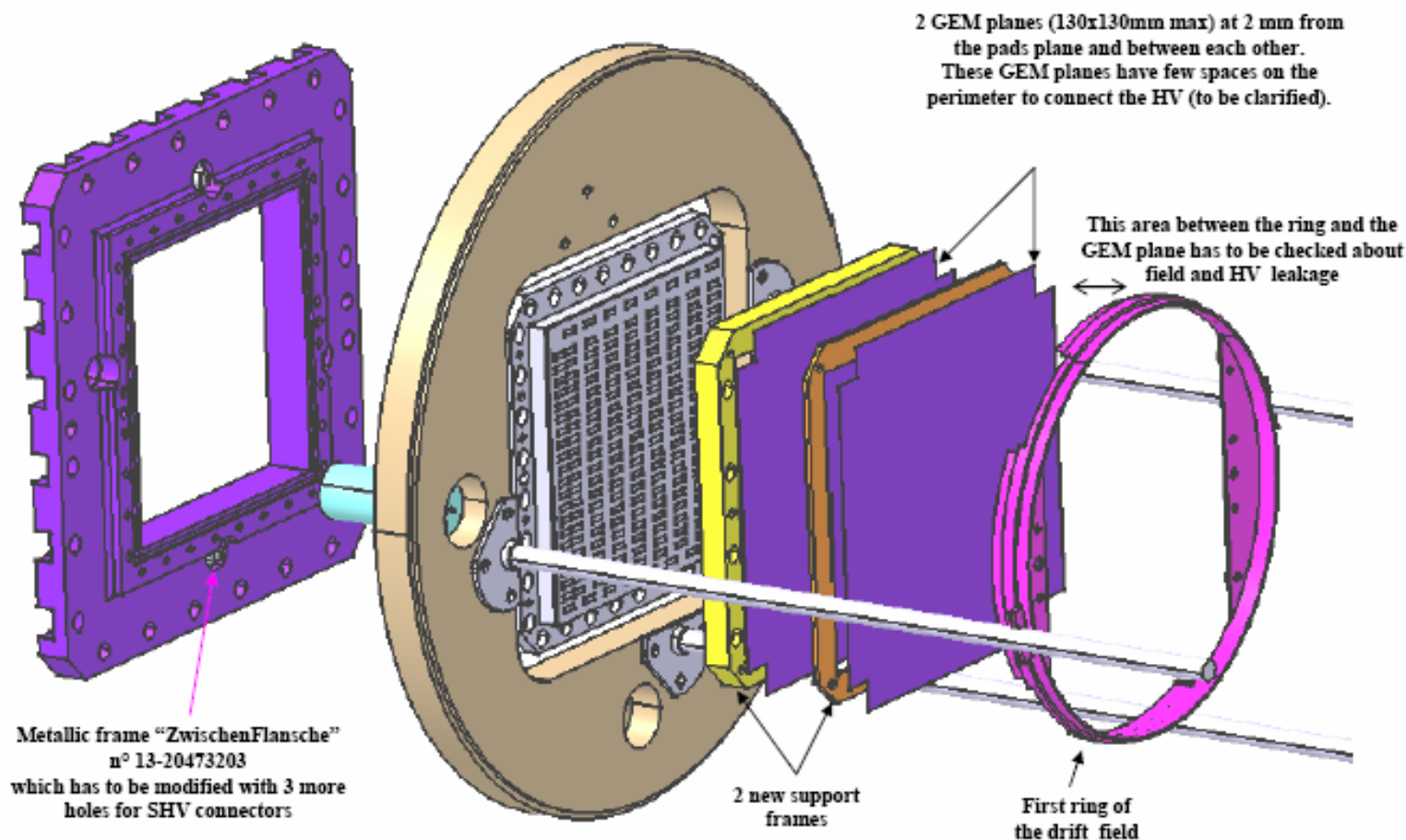
(Joel, Philippe, Vincent and others...)

Meetings about once a month

- Looking at end-plate mechanics -> material dominated by electronics -> will $< 30\%$ rad. length be possible?
- Now designing triple-Gem plane for MPI prototype, to be tested later at KEK

Exploded view of the modified MPI TPC equipped with 2 GEM planes

- Some minor modifications seems already necessary: More holes for the SHV connectors.
- 2 support frames for GEM can be built.



GEM planes for MPI prototype

Arrangements of detectors on the active area of the end cap (2/2)

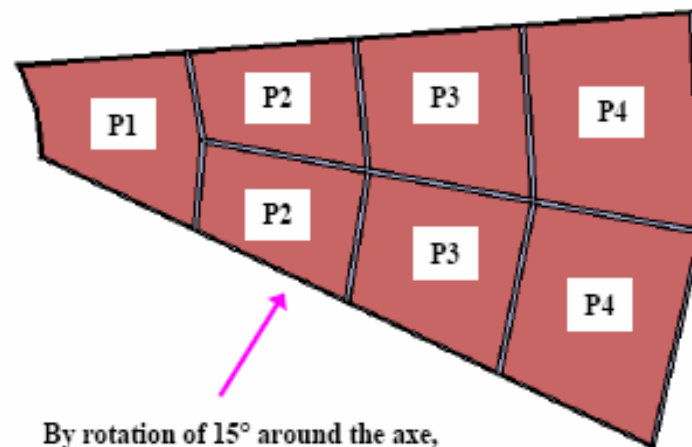
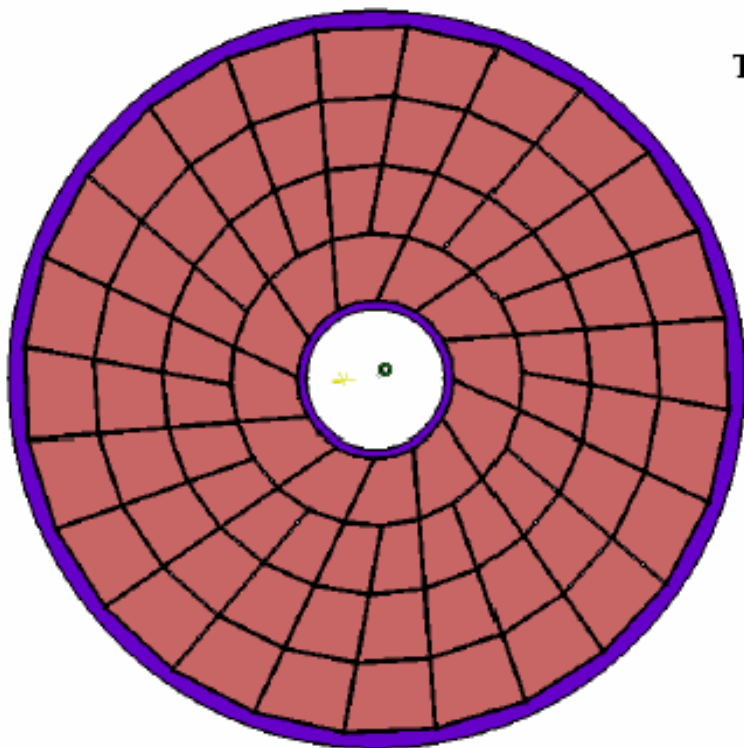
Trapezoidal shapes assembled in iris shape

Annotations: P_x is the type number of PADS boards or frames

12 sectors (30° each) as super modules are defined

On each, 7 modules are fixed

The sizes of detectors are varying from 180 to 420 mm

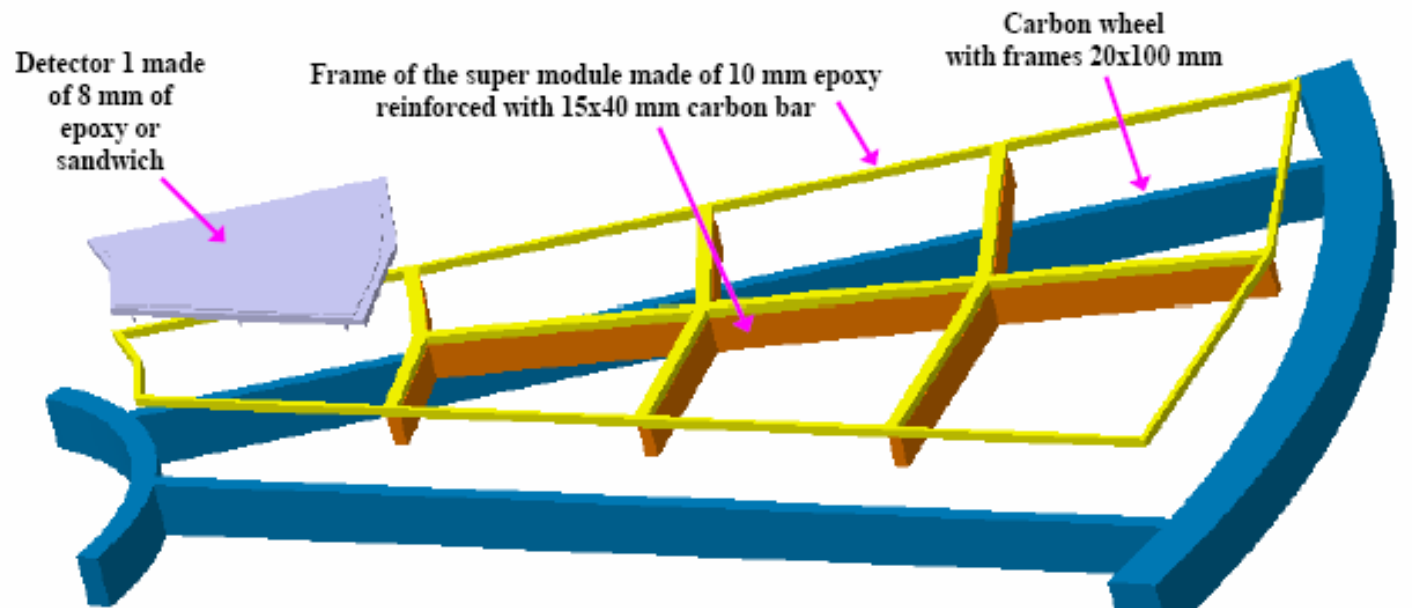


By rotation of 15° around the axe,
these frames are the same

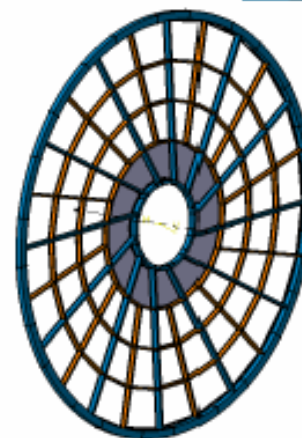
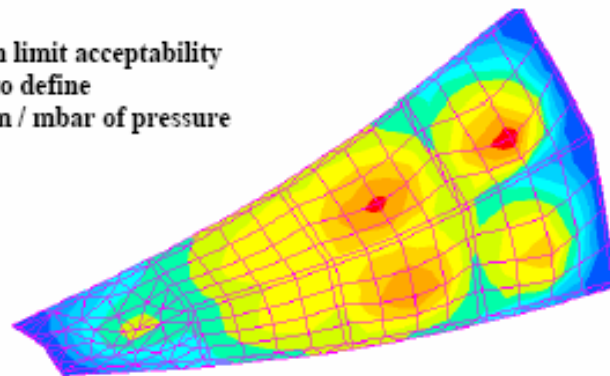
These arrangement seems to be the best as only 4
different PADS are necessary

End-plate studies

Principle for a Super Module equipped with detector 1



Deformation limit acceptability
to define
Here is 20 μm / mbar of pressure



Complete wheel
with 12 super
modules

End-plate studies

Possibilities for Silicon readout

(see talk by Jan Timmermans)

◆ Momentum measurement--

- for TPC only (from TDR) $\rightarrow \delta(1/p) = 10^{-4} \text{ GeV}/c^{-1}$ (200 pad rows, 120 μm point resolution and vertex constraint)
- can get **same $\delta(1/p)$ with digital TPC and 1mm pads** (1200 pad rows "pads partout"). Here, need only time-bucket i.d. of pads above threshold. Readout speed?...see next point.

Possibilities for Silicon readout

◆ dE/dx measurement -

Study by Michael Hauschild \Rightarrow

dE/dx

Particle Identification Techniques with dE/dx

● **Some restrictions**

- Large scale particle physics detectors only
- Gaseous detectors only
 - no dE/dx with silicon detectors

● **Outline**

- Basics and fundamental problems of dE/dx measurements
- Some performance figures (resolution, particle separation power)
- A 20-years summary
- The future of dE/dx (at the e^+e^- Linear Collider)
 - Cluster Counting in 2D with micropattern detectors + small pads?

Possibilities for Silicon readout

◆ dE/dx measurement by cluster counting

- needs slow gas with small diffusion coefficient (e.g., He/NeCO₂)
- needs detailed simulation with diffusion properly included, but it looks like

- ◆ need ~ 100 - 200 μm pads "partout"

- ◆ need ~ 100 MHz sampling speed