



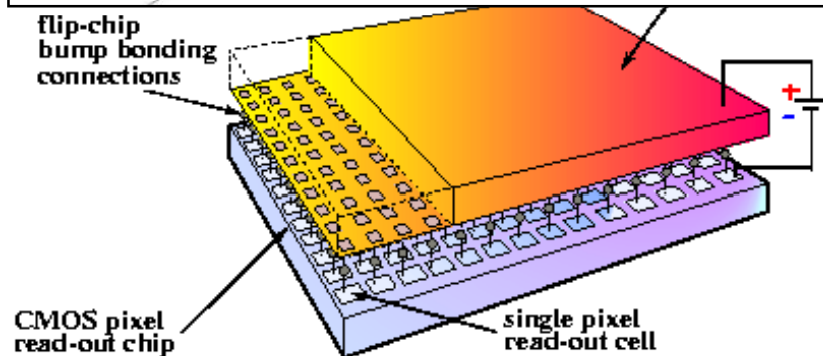
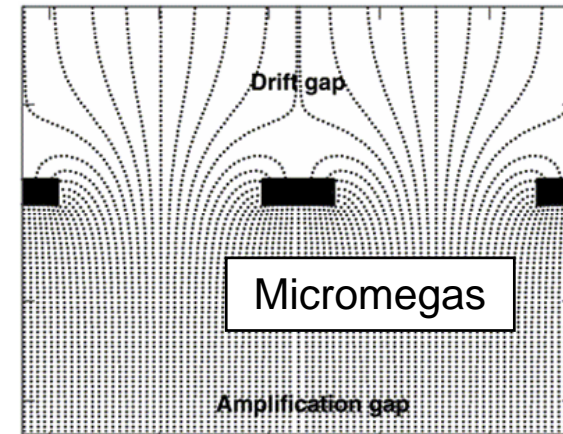
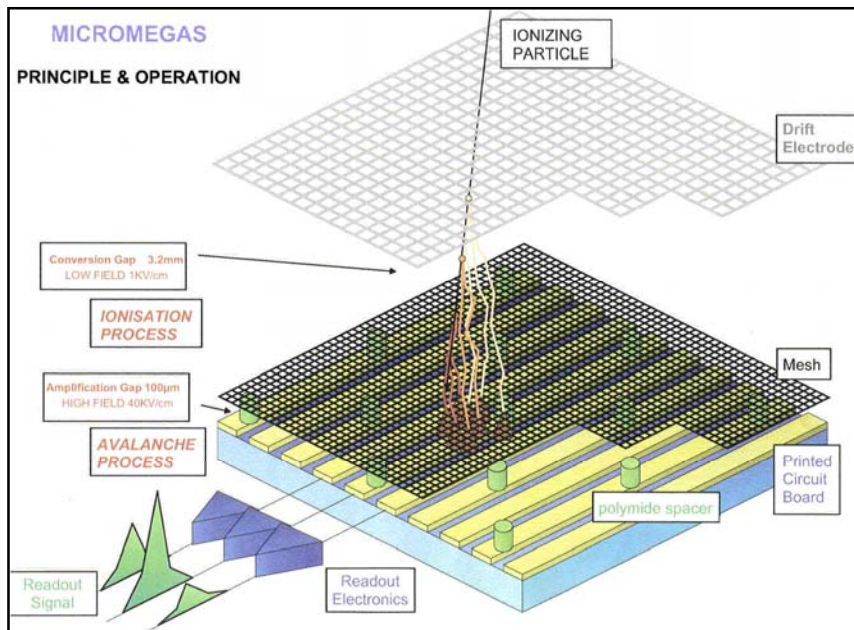
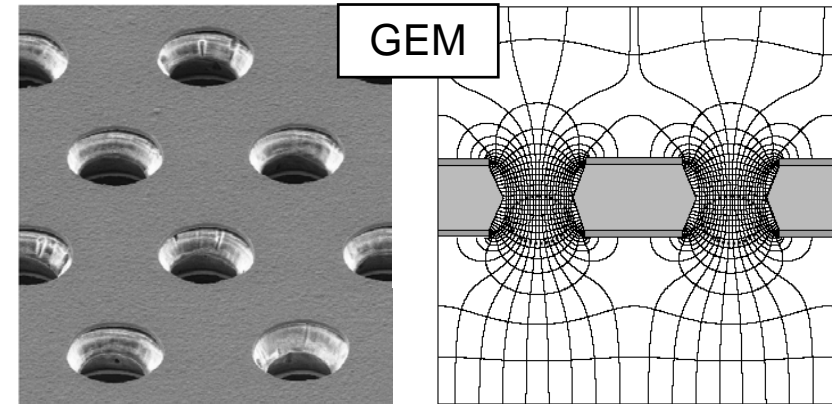
A Silicon TPC System

LPTPC endplate discussion
Chicago, 15 November 2008

Jan Timmermans
NIKHEF

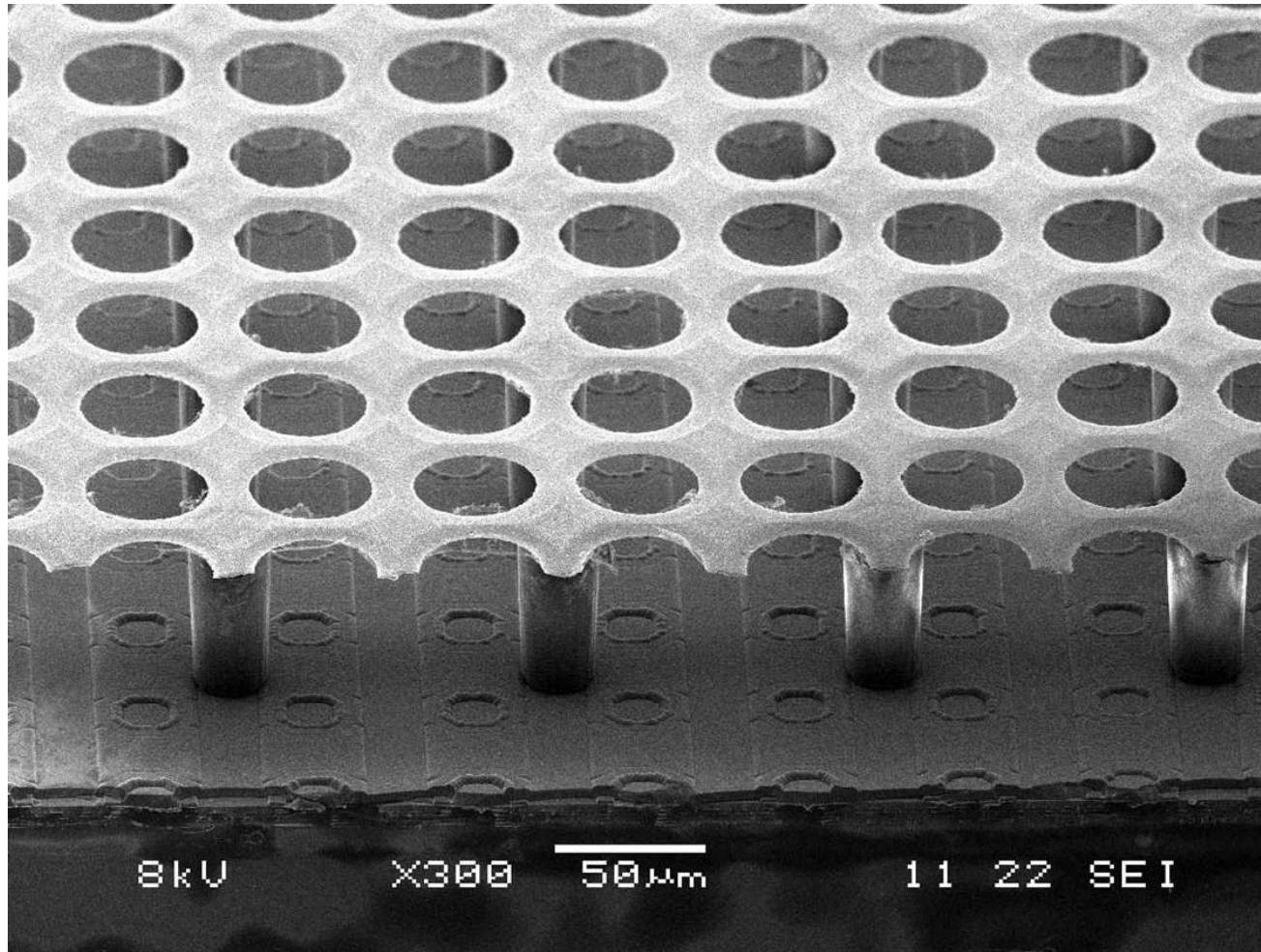
Micro Patterned Gaseous Detectors

- High field created by Gas Gain Grids
- Most popular: GEM & Micromegas



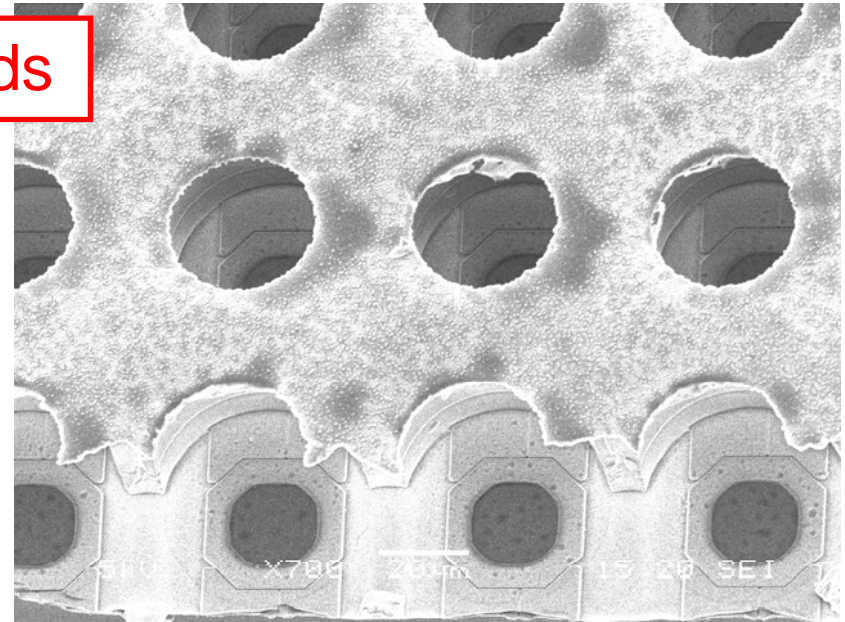
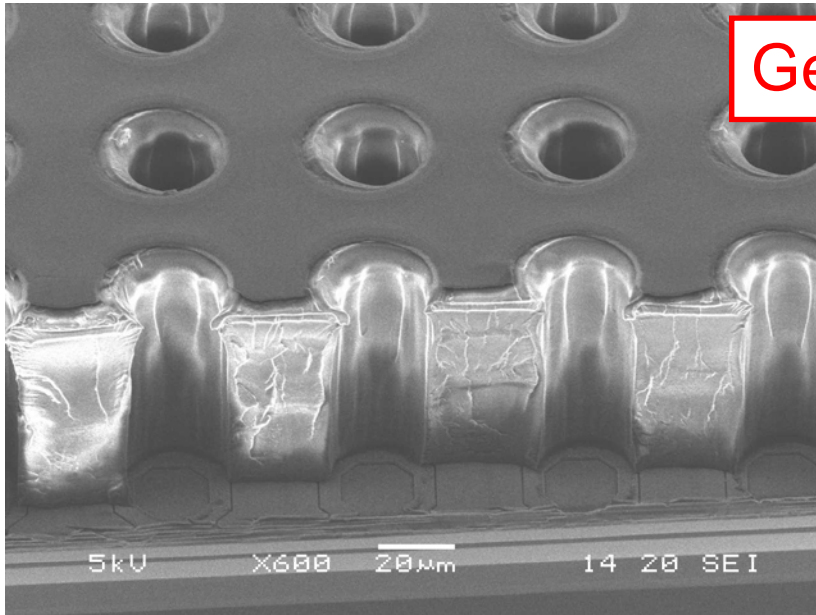
Use 'naked' CMOS pixel readout chip as anode

Integration pixelchip, discharge protection and gas amplification

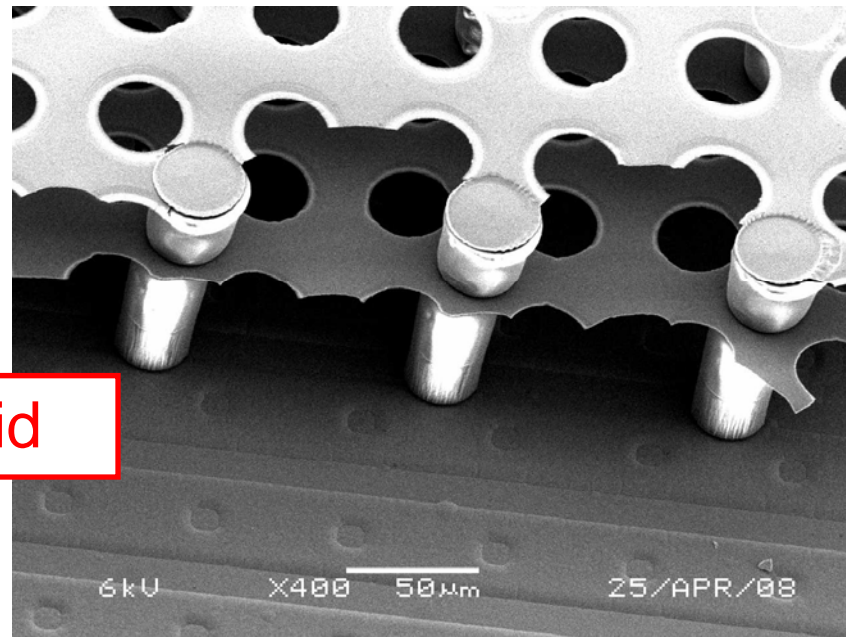


Alternatives

GemGrids

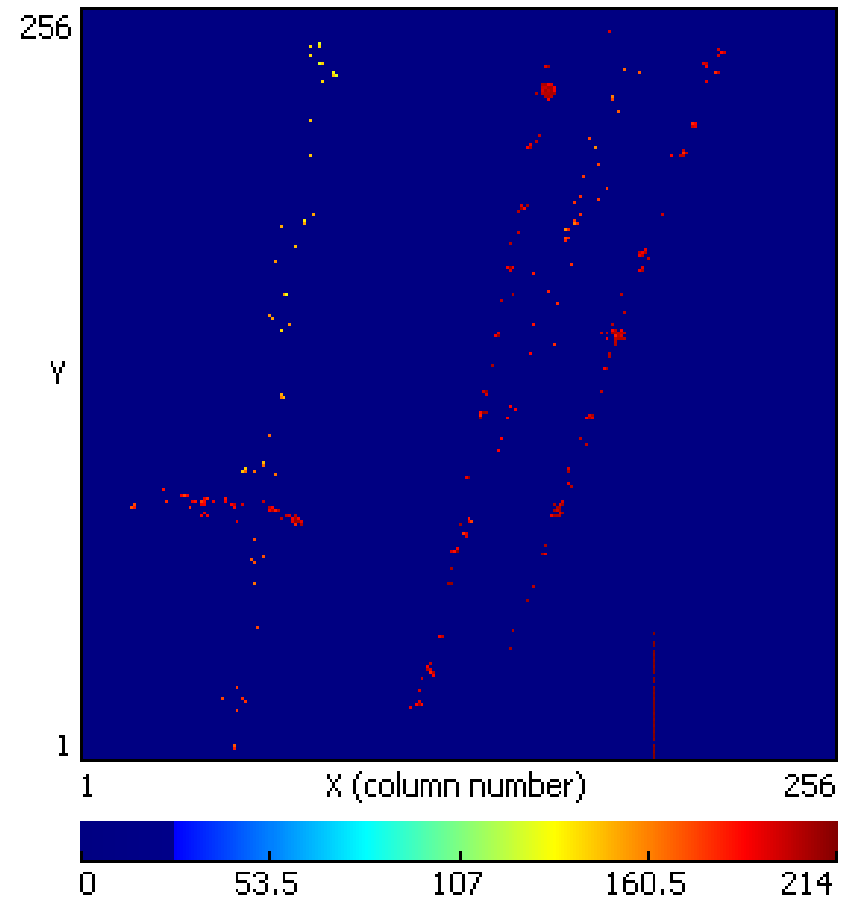
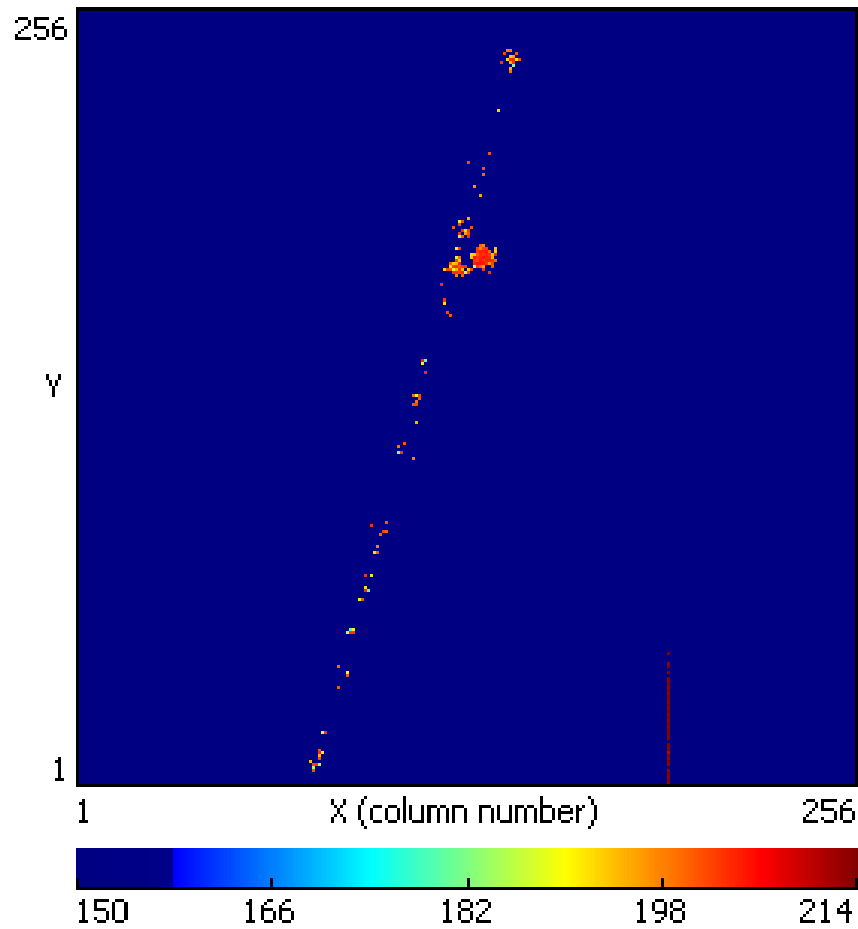


TwinGrid



Some tracks

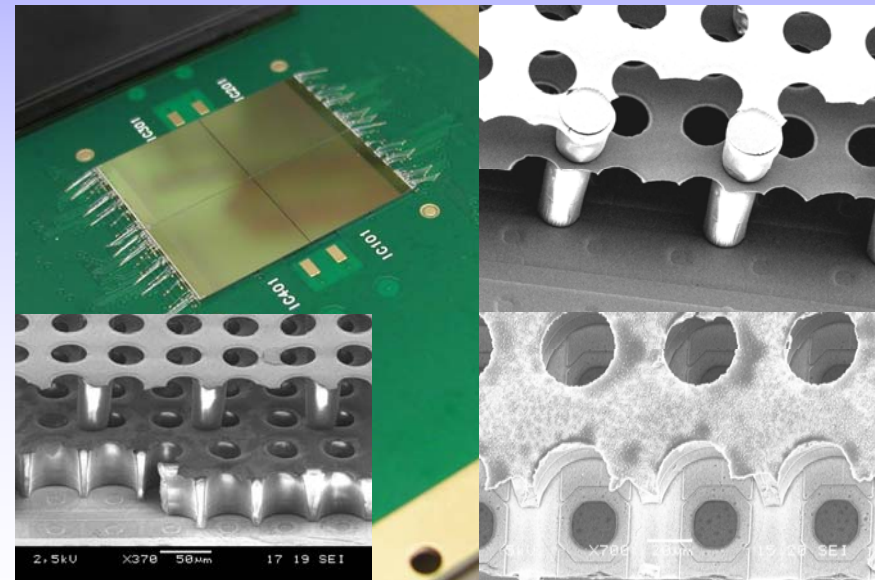
(with Ingrid in 5 GeV CERN T9 testbeam)



Work in progress

- (Post) processing in Twente.
 - Both SiNProt and InGrid can be applied.
 - Chip squares of 3X3 timepix chips instead of individual chips.
 - Search for high res InGrids. (Si_3N_4)
- Optimize protection and signal integrity.
 - Discharge test structures.

- Timepix2 chip
- Scaling up.
 - 4 chip detectors (3X3 cm).
 - 64 chip detector (12X12 cm).



Discussion

- “large scale” integration:
 - integration grid and readout seems mandatory
- No separation pads and electronics!
 - **electronics is inside the gasvolume**
- ‘only’ need to combine readout of several individual chips; high-speed readout
- Presently two types interface: Muros-2 and USB (waiting for USB-2)
- Working on “large scale” readout

Multichip boards

- Bonn: two 4-chip boards for LCTPC
- Saclay: 8-chip board for LCTPC
- NIKHEF: 4-chip board (working in readout)

All had problems with power(regulation);
being solved

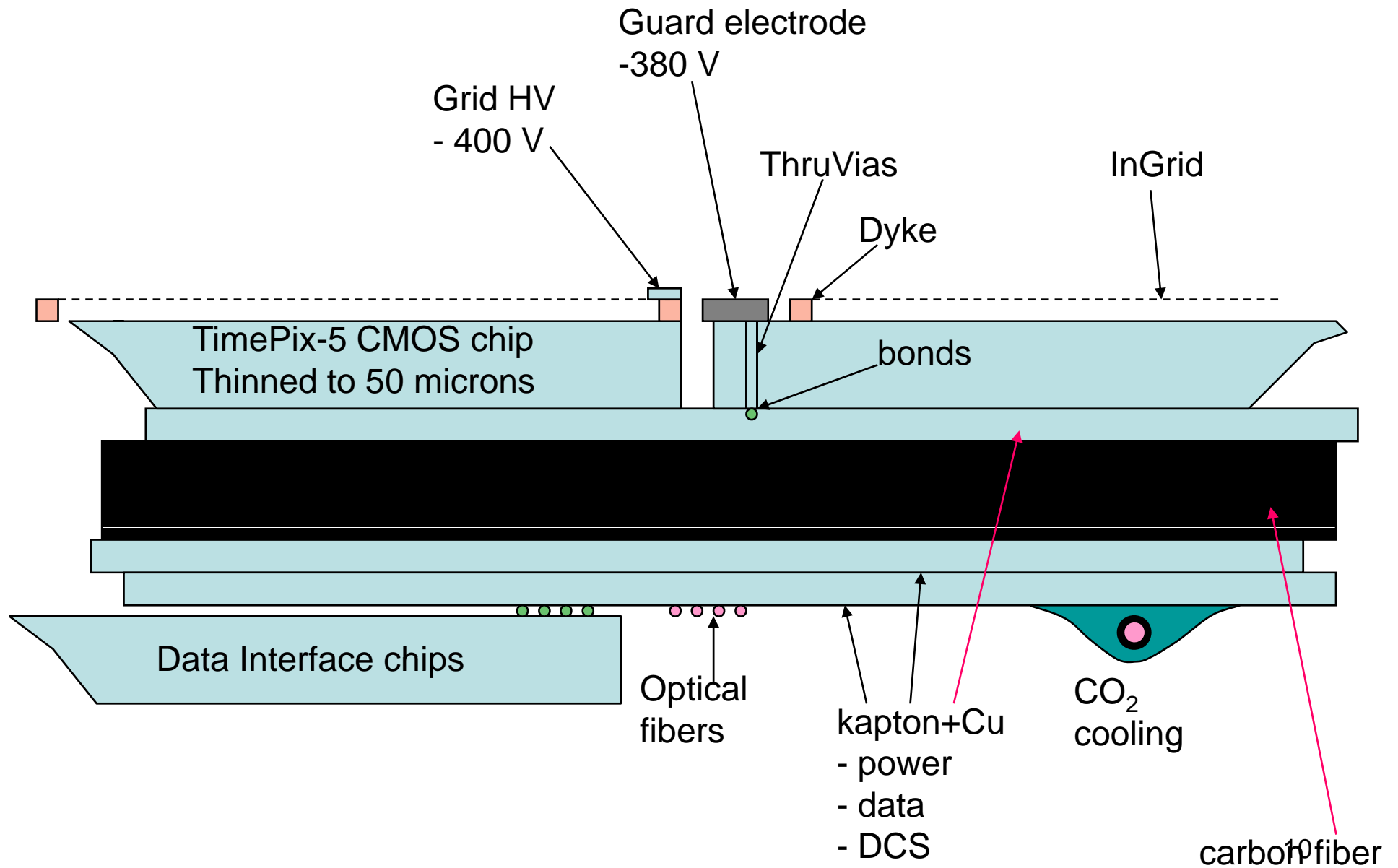
- NIKHEF also aiming for 8x8-chip system
in 2009/10

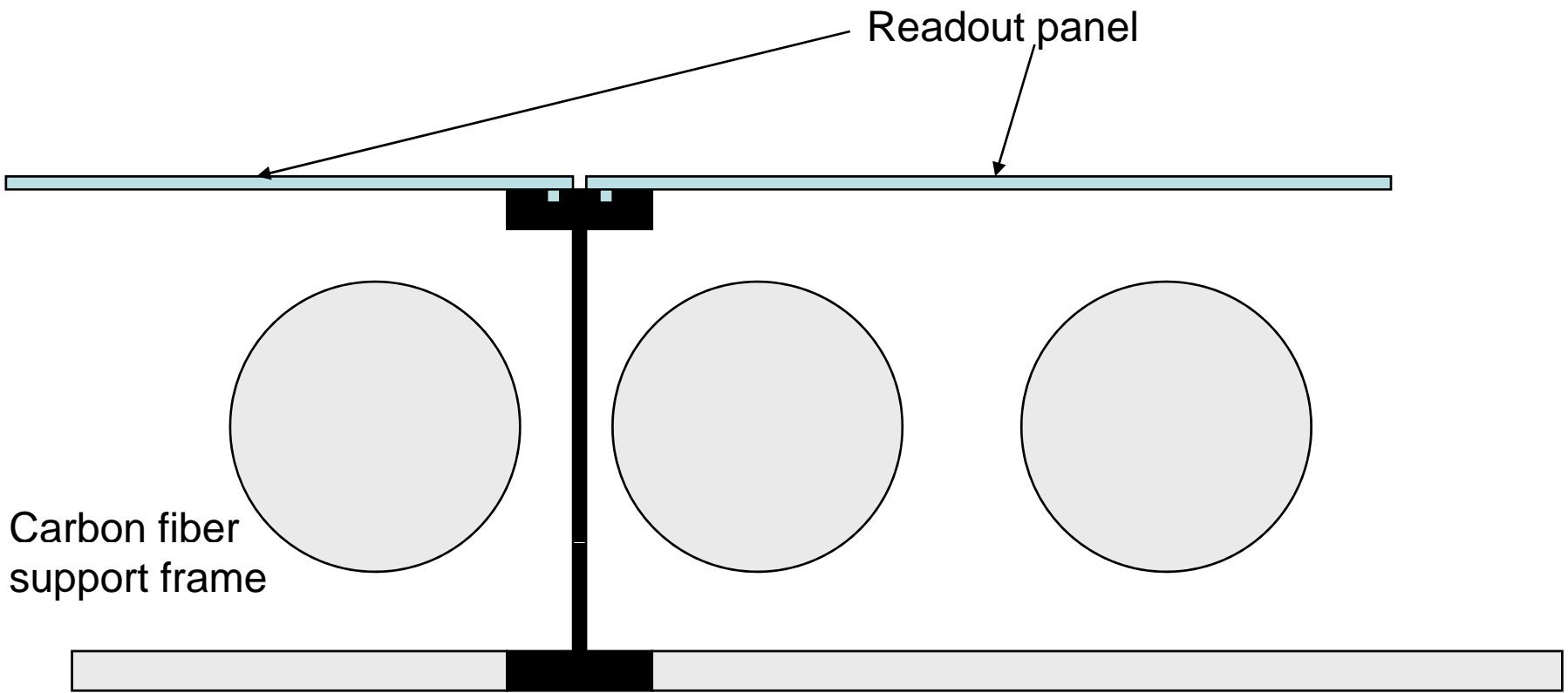
Cooling

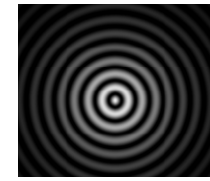
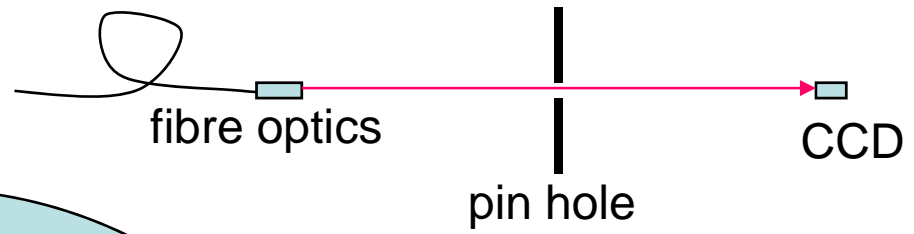
- Timepix power consumption:
 - static digital 0.44 W/chip
@ 2.2V Vdd, 100MHz
 - max. analog 0.42 W/chip @2.2V Vdd
- Total ~ 3kW/m² , w. pulsed power ~30 W/m² ?
+ power for data readout (outside gas)!
- Timepix-2 version (0.13 μm CMOS) should consume much less
- Experience at NIKHEF with CO₂ cooling (LHCb)
- But no engineering work done yet for TPC endplate

Follow some slides by Harry van der Graaf:

Cross section of standard GridPix readout panel







10 nm

