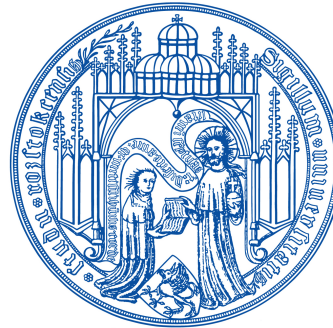# TDC electronics for the TPC
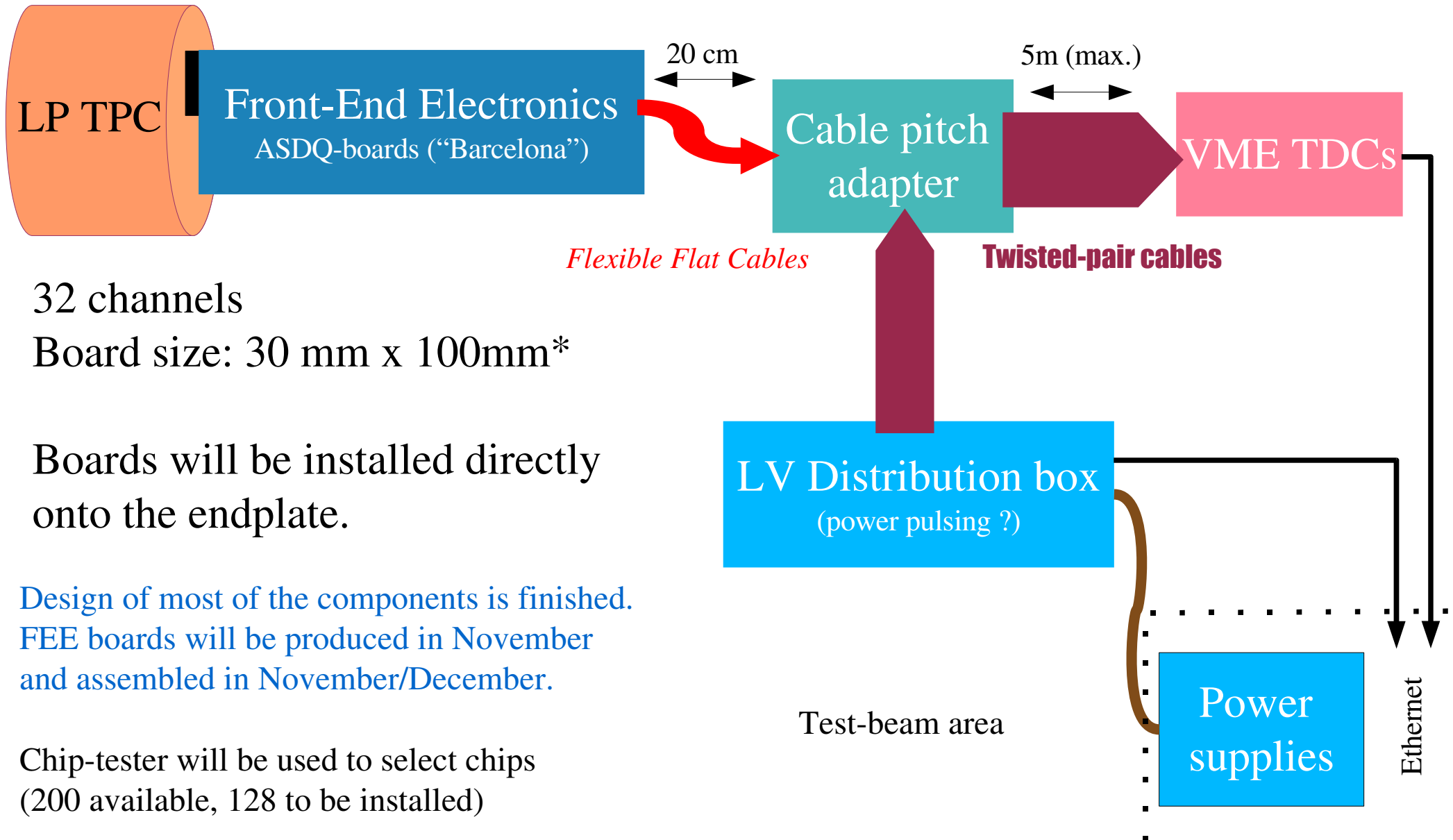
Universität Rostock

A.Kaukher O.Schäfer H.Schröder R.Wurth

EUDET Annual Meeting 2007
École Polytechnique, Paris
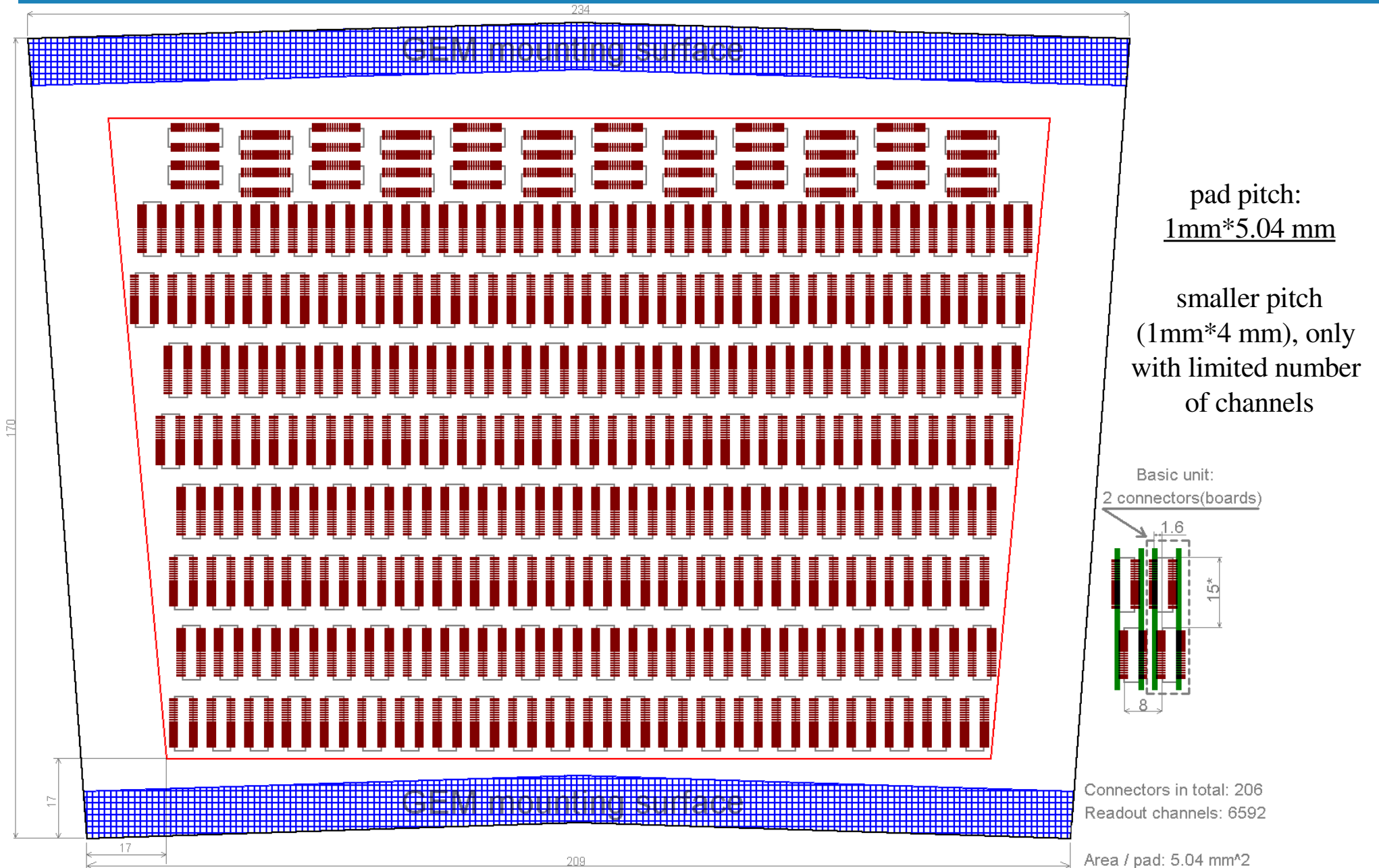
TDC-based readout electronics for LP TPC

LP TPC

Front-End Electronics
ASDQ-boards ("Barcelona")

20 cm

Flexible Flat Cables

Cable pitch adapter

5m (max.)

VME TDCs

Twisted-pair cables

32 channels
Board size: 30 mm x 100mm*

Boards will be installed directly onto the endplate.

LV Distribution box
(power pulsing ?)

Design of most of the components is finished.
FEE boards will be produced in November and assembled in November/December.

Chip-tester will be used to select chips
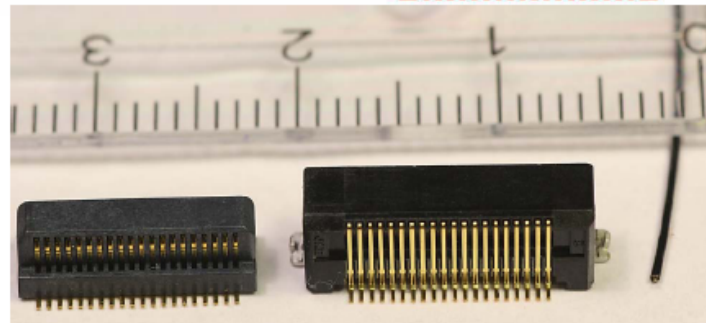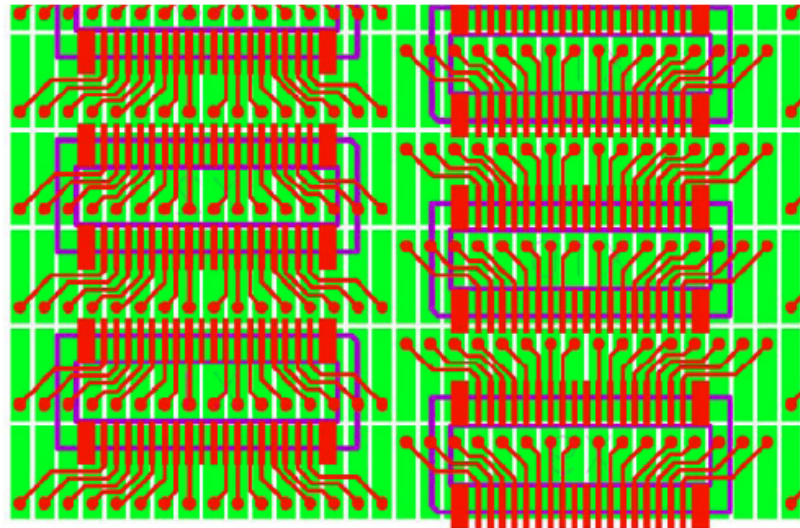(200 available, 128 to be installed)

Test-beam area

Power supplies

Ethernet

A Padplane: study for LP TPC

pad pitch:
1mm*5.04 mm

smaller pitch
(1mm*4 mm), only
with limited number
of channels

Basic unit:
2 connectors(boards)

Connectors in total: 206
Readout channels: 6592

Area / pad: 5.04 mm^2

Readout electronics interface

Example of signal routing from 1x4 mm² pads to the WR-40S connector

- Smalles foreseeable pad size 1x4 mm²
- The connector should match this size
- Highest possible flexibility in pad geometry $\Rightarrow$ small modules
- Japan Aviation Electronics offers a 40 pin connector with 0.5 mm pitch and dimensions 13.9x4.7 mm²
- 32 pins for signals and 8 pins for grounding

L. Jönsson, EUDET Annual meeting 2006

Thermal simulation

K

280.9
279.7
278.7
277.6
276.6
275.6
274.6
273.6
272.8

K

273.084
273.047
273.017
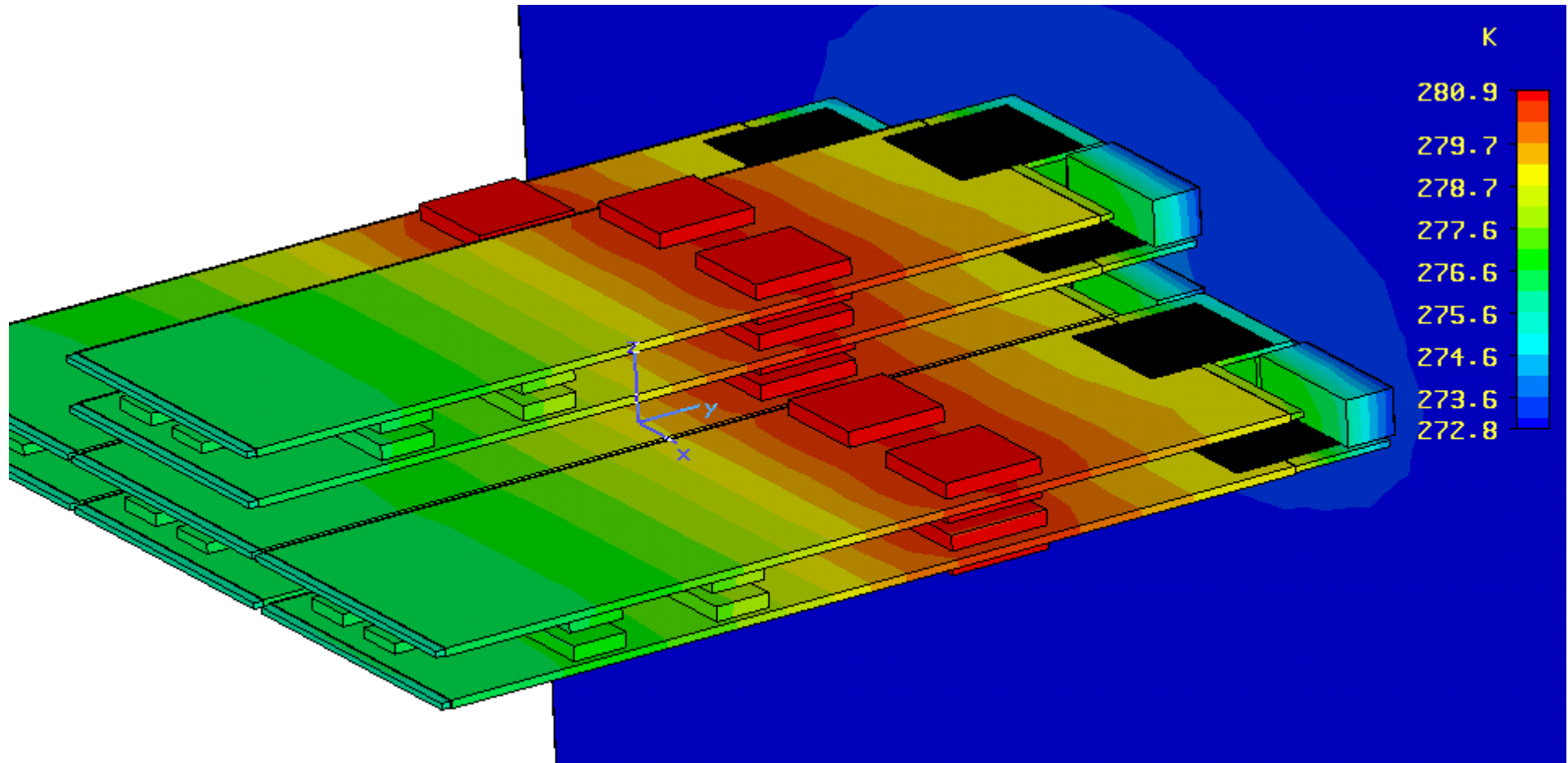272.988
272.958
272.928
272.898
272.869
272.846

Static thermal simulation with *CST EM Studio*

Preliminary

ASDQ power dissipation: 40mW/channel
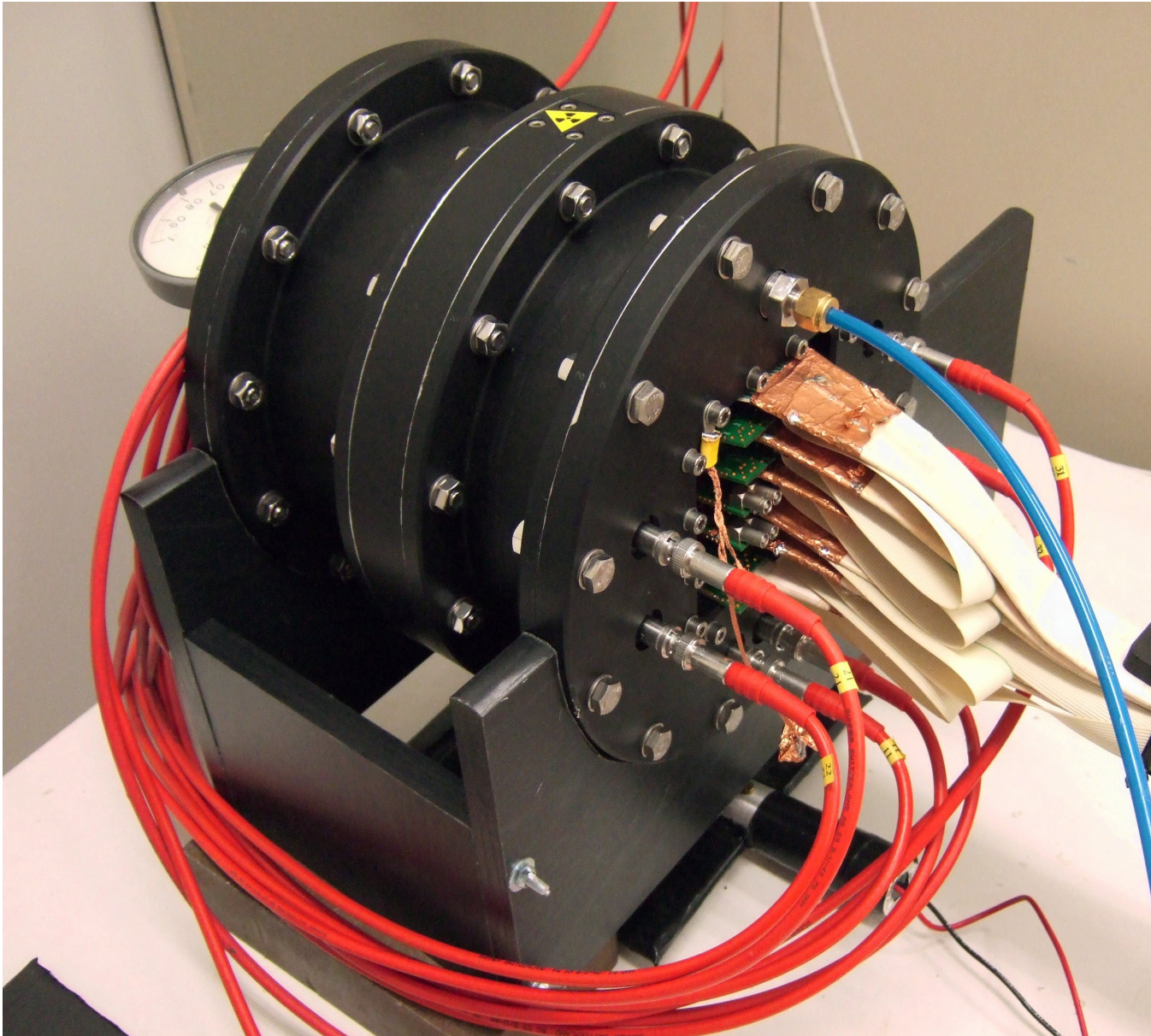Ambient temperature: 273.1 degree Kelvin
No straight forward implementation of the air flow

Thermal simulation

Preliminary

Features :

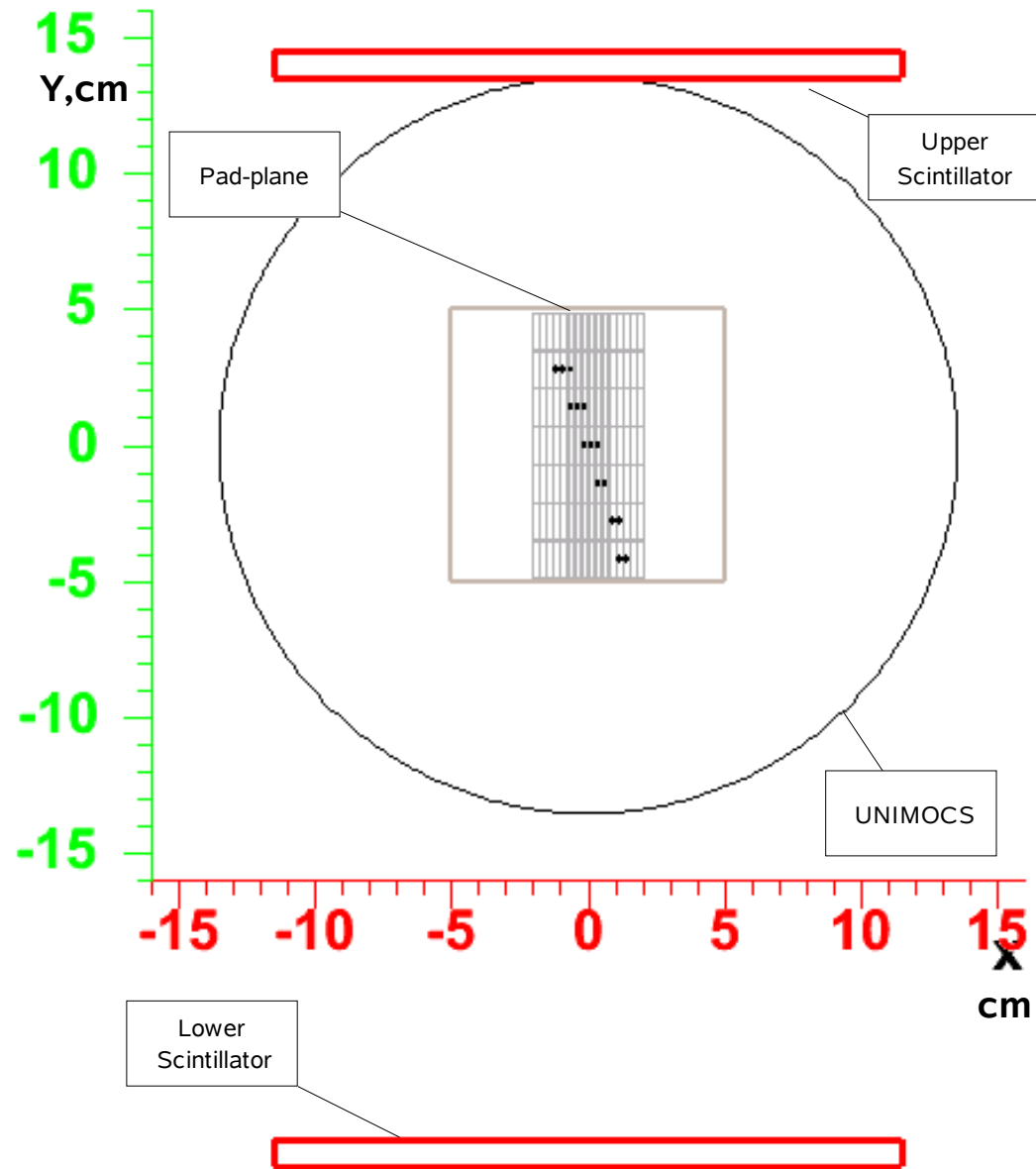   triple GEM setup

    drift length 3 cm

    no field cage

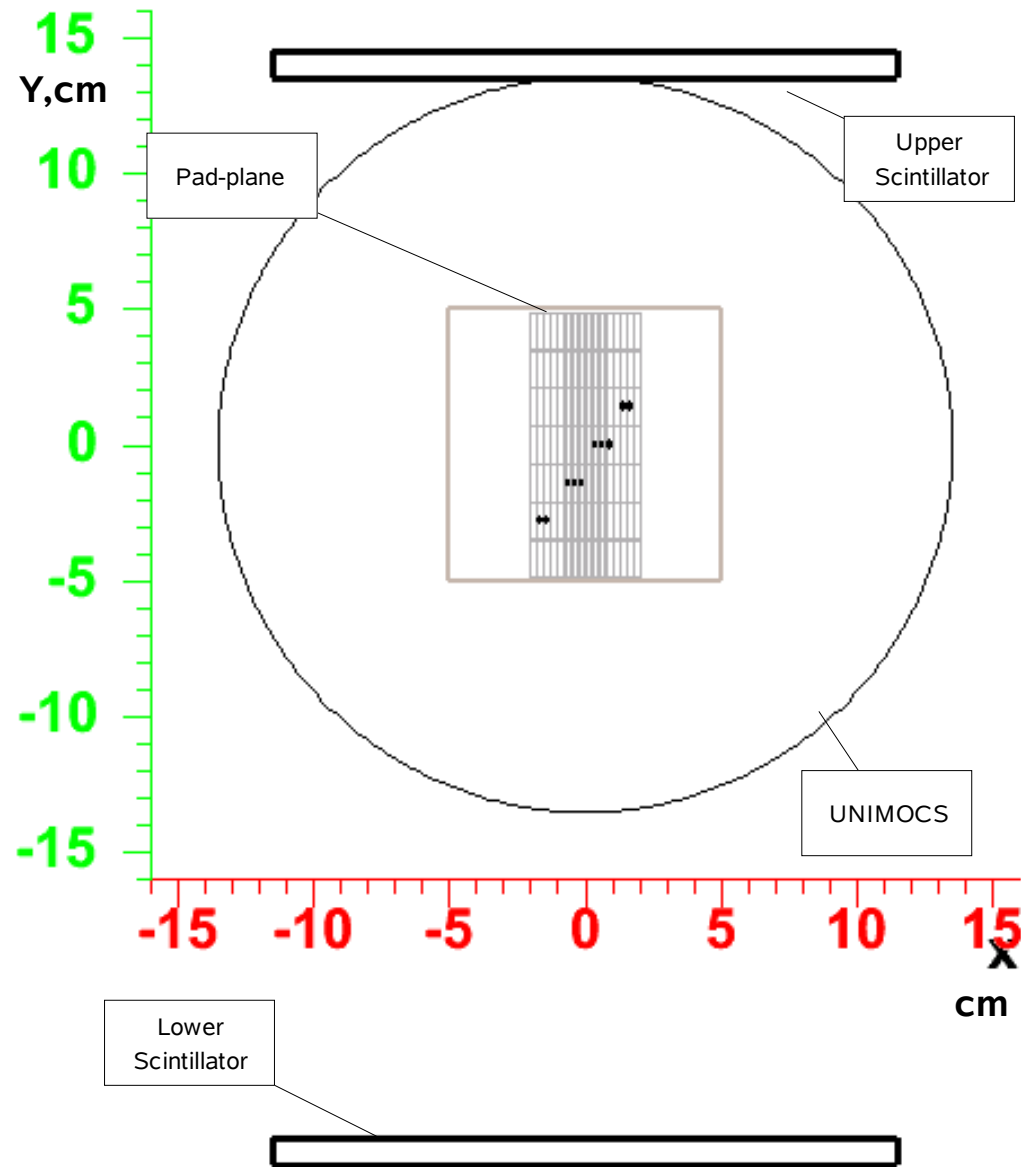   7x16 pads

       (2.5mmx14mm)

*Designed by O.Schäfer

UNIMOCS detector: first tracks

*DAQ software by
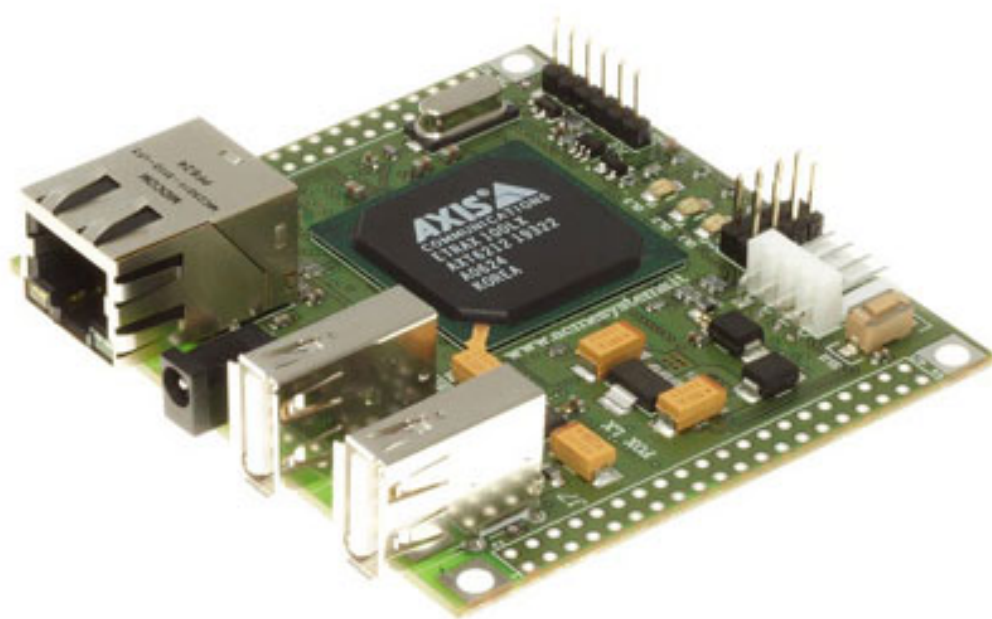Natalia Okatieva (MEPhI),
DESY summer student

UNIMOCS detector: continuous readout (trigger on data)

Low voltage distribution box

The FOX board will be used to control parameters of the FEE-boards.

LVTTL (on the FOX board) -> LVDS-> cables -> LVDS-LVTTL -> DAC (thresholds,...)

Can be also used for power pulsing option (in development)

FOX Board, a complete Linux system (66 x 72 mm)

FOX LX832:
8MB FLASH 32MB RAM
32 bit, 100MHz CPU

• standard TCP/IP I/O ->
    simplifies integration with existing DAQ

• Two 40 pins sockets step 2.54mm (0.1")
with LVTTL I/O

• Two USB ports: USB-disk, webcam,...

Summary and Outlook

TDC readout electronics with larger number of channels will be assembled for LP TPC. The FEE boards are based on existing components.

Length of the twisted-pair cables to be defined (now: 5m cables) - the shorter the better. Limitation comes from positioning of the VME crate in vicinity of the PCMAG.

Some questions <u>still</u> need to be answered:
- mechanical support of the Cable Pitch Adapters and twisted-pair cables
- proper "grounding" (including support structure, the magnet,...)
- cooling

FEE boards – November 2007, assembly in December.

Most of the hardware to be ready by the end of the year (except LV distribution box)
Software and documentation - January/February 2008