

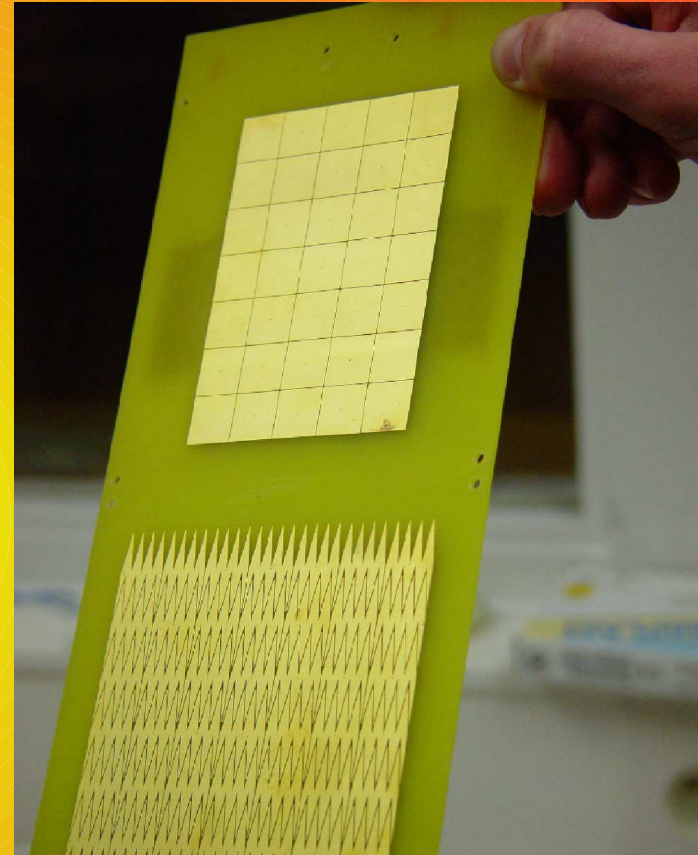
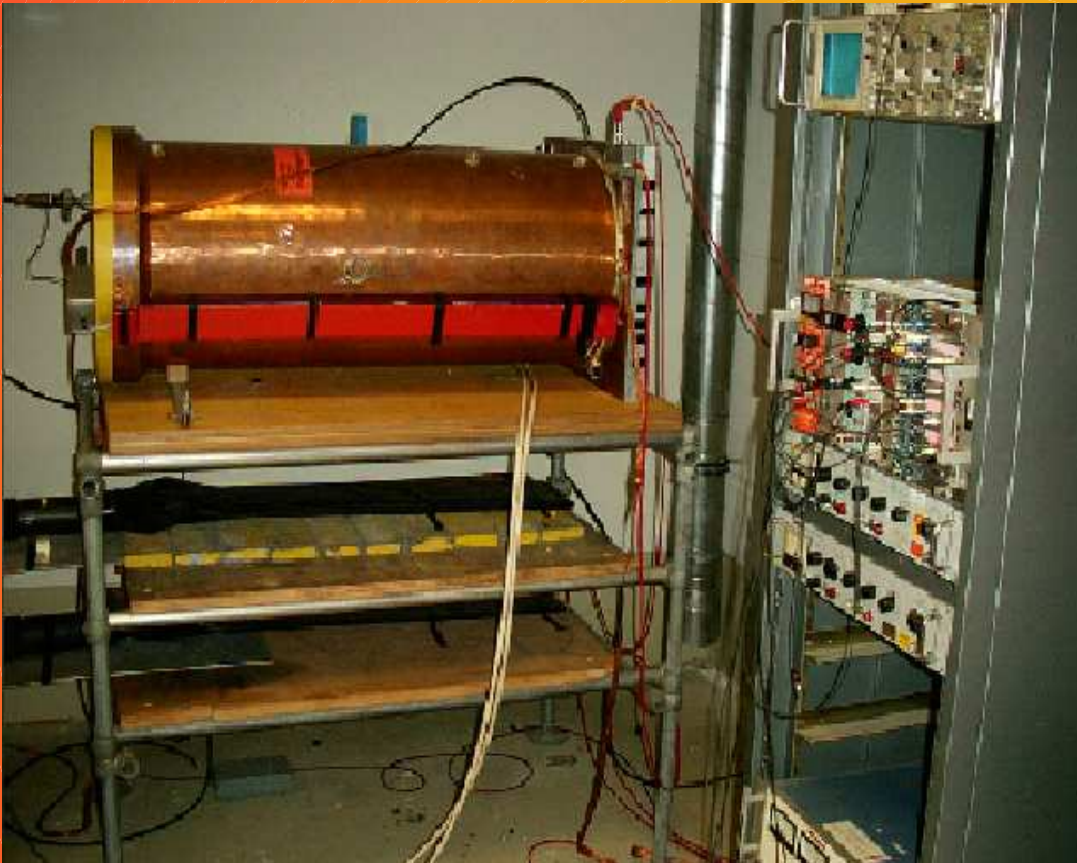
# TPC R&D Activities in Hamburg

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DESY Hamburg

# Overview

- Resolution measurements for rectangular pads and chevrons
- TDC based readout studies
- Installation of 5 T magnet facility
- New charge transfer test chamber
- New large TPC prototype
- Field cage development

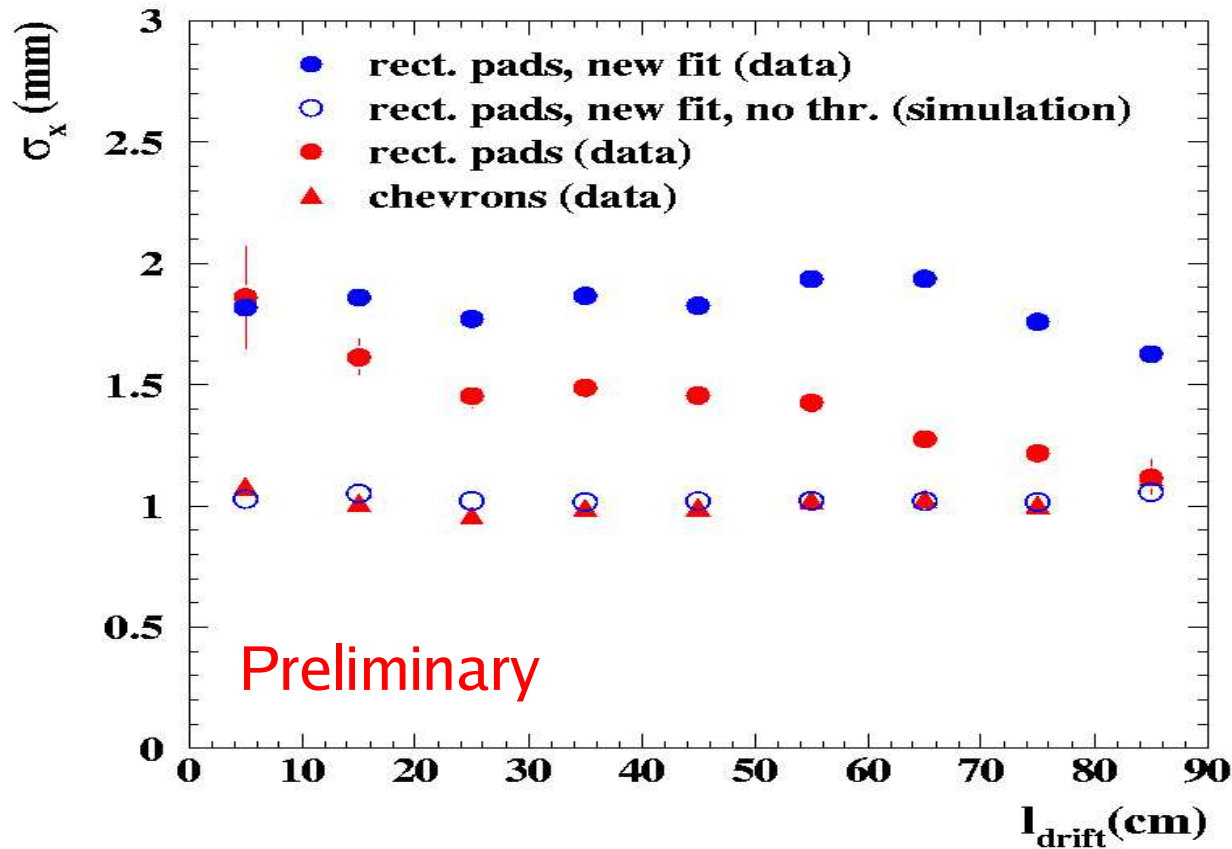
# Large TPC



- Double GEM structure
- Gas: Ar-CH<sub>4</sub>-CO<sub>2</sub> (93-5-2)
- Cosmic muons as particle source
- Pads of size 14x14 mm<sup>2</sup>
- ALEPH readout electronics
- 35 readout channels



# Resolution Measurements



Old fit:

Simple center of gravity method to reconstruct tracks

New fit:

Assumes gaussian charge distribution of tracks as proposed by Dean Karlen

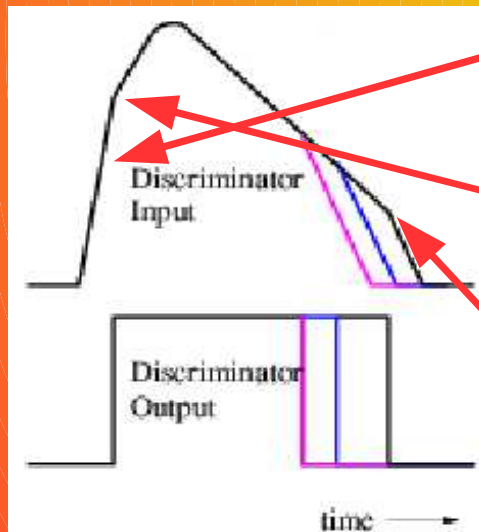
The implementation of a threshold in the new fitting technique is absolutely mandatory

# TDC Readout

Idea: Use of a charge-to-time conversion amplifier (e. g. ASDQ) in conjunction with a TDC instead of a FADC

Advantages: Cheaper, reduced data flow, less power consumption

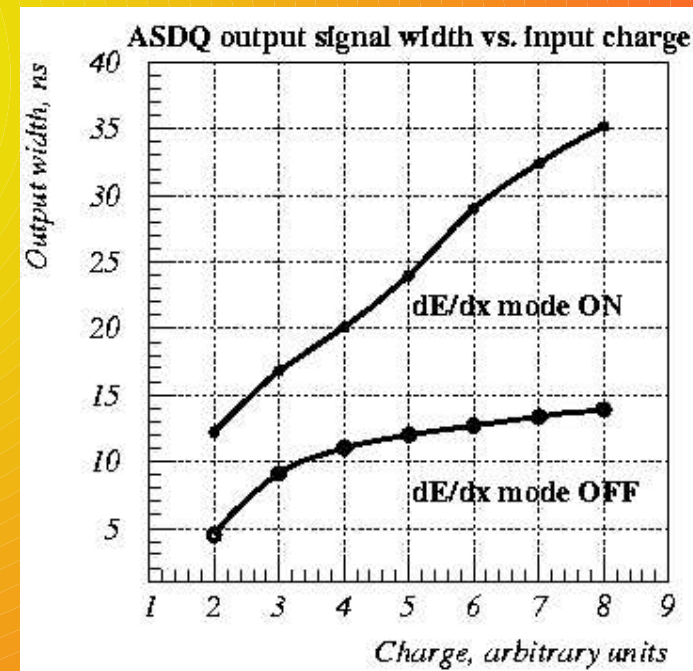
ASDQ Thresholds:



**Leading edge:**  
Fast shaping (8 ns)

**If dE/dx mode on:**  
Switch to 28 ns for charge integration

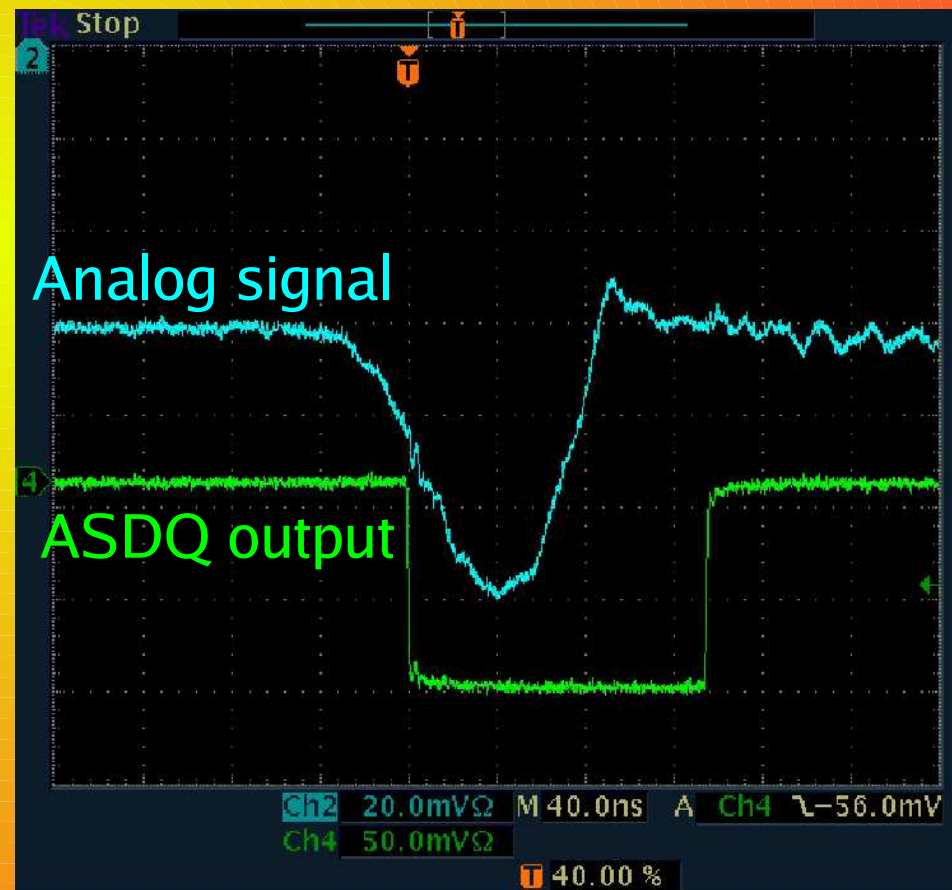
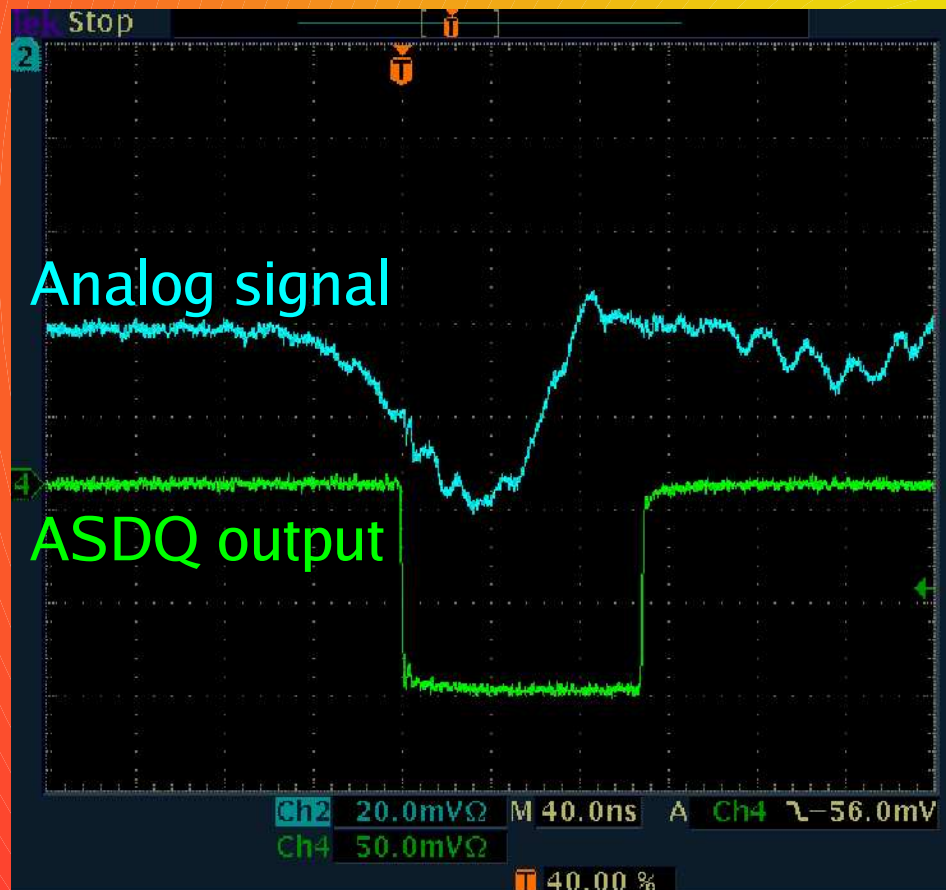
**Trailing edge:**  
Switch back to short integration time



# ASDQ Tests

Signals by cosmons read out from one pad using ASDQ chip:

Area of analog puls  $\sim$  charge on pad





# 5 T Magnet Facility

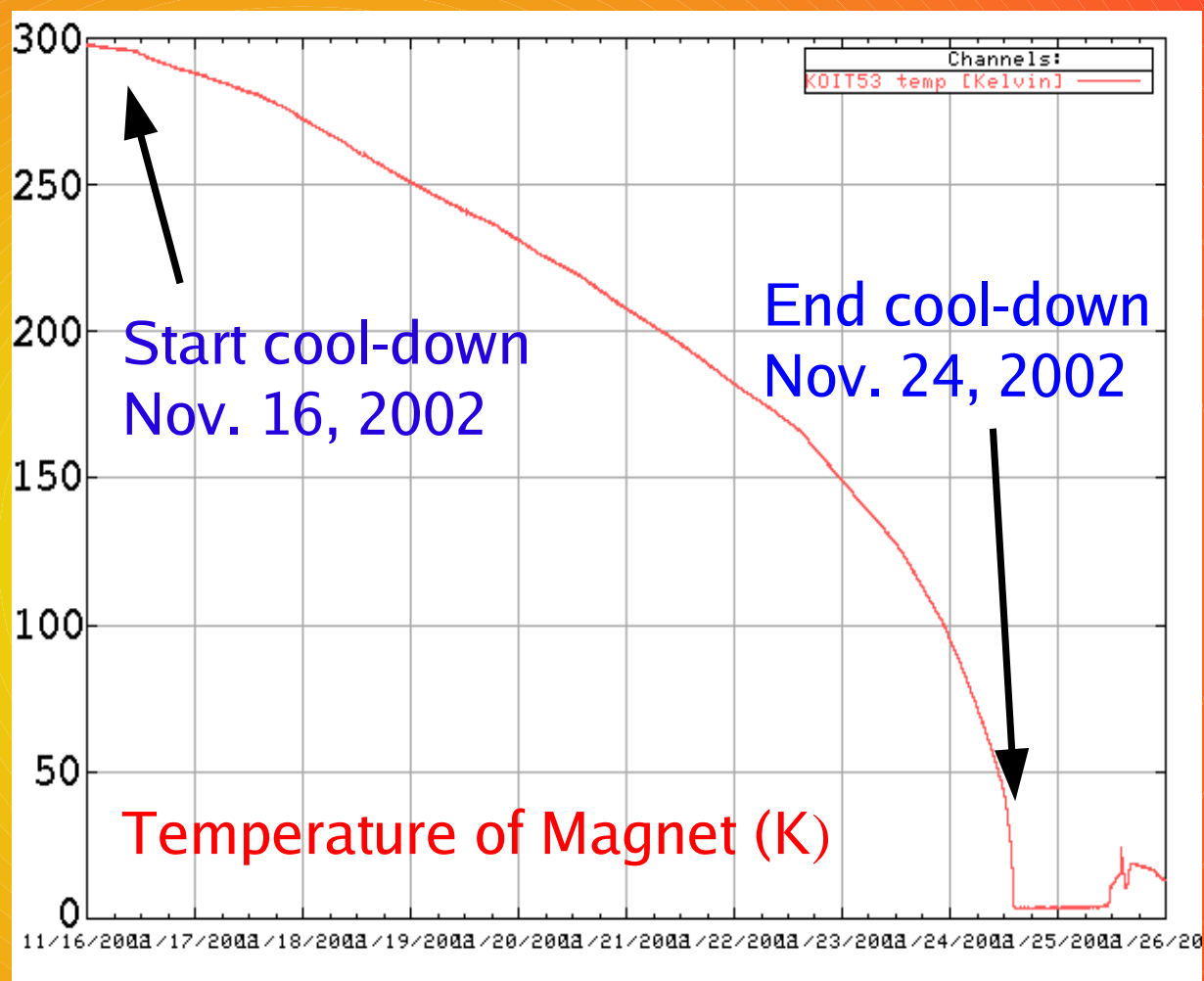
Former ZEUS compensating magnet

- Superconducting
- Max. field  $> 5$  T
- Diameter 28 cm
- Length 187 cm



# Commissioning of the Magnet

- Start of cool-down:  
Nov. 16, 2002
- End of cool-down:  
Nov. 24, 2002
- First magnet tests:  
Nov. 27, 2002
- First time 5 T:  
Dec. 03, 2002



First TPC studies in magnet on December 18, 2002  
Findings → talk by Martin Killenberg



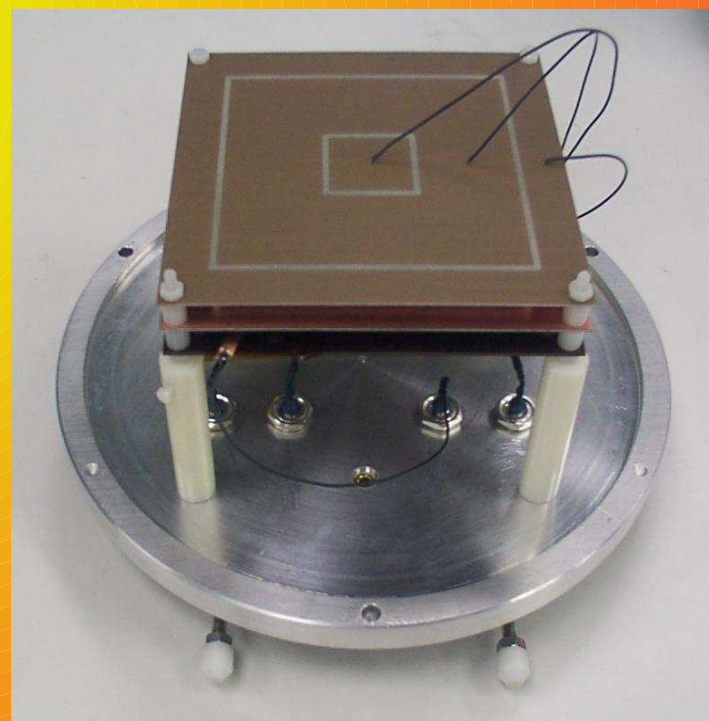
# DESY Test Chamber



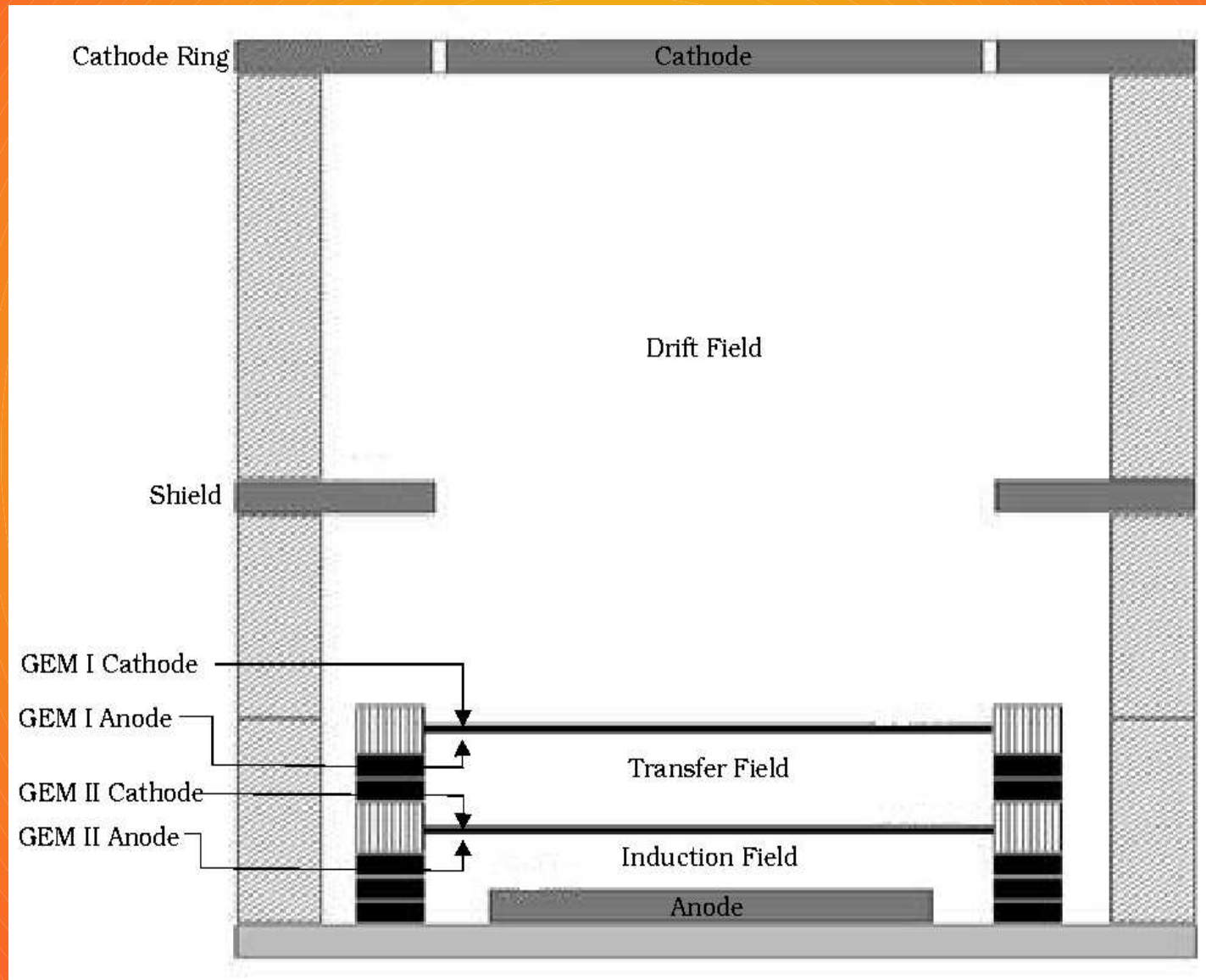
- Length 22 cm
- Diameter 25 cm
- Fits into 5 T magnet
- Double GEM structure

Has a very flexible GEM tower setup:

Easy to switch between CERN and Novgorod GEMs

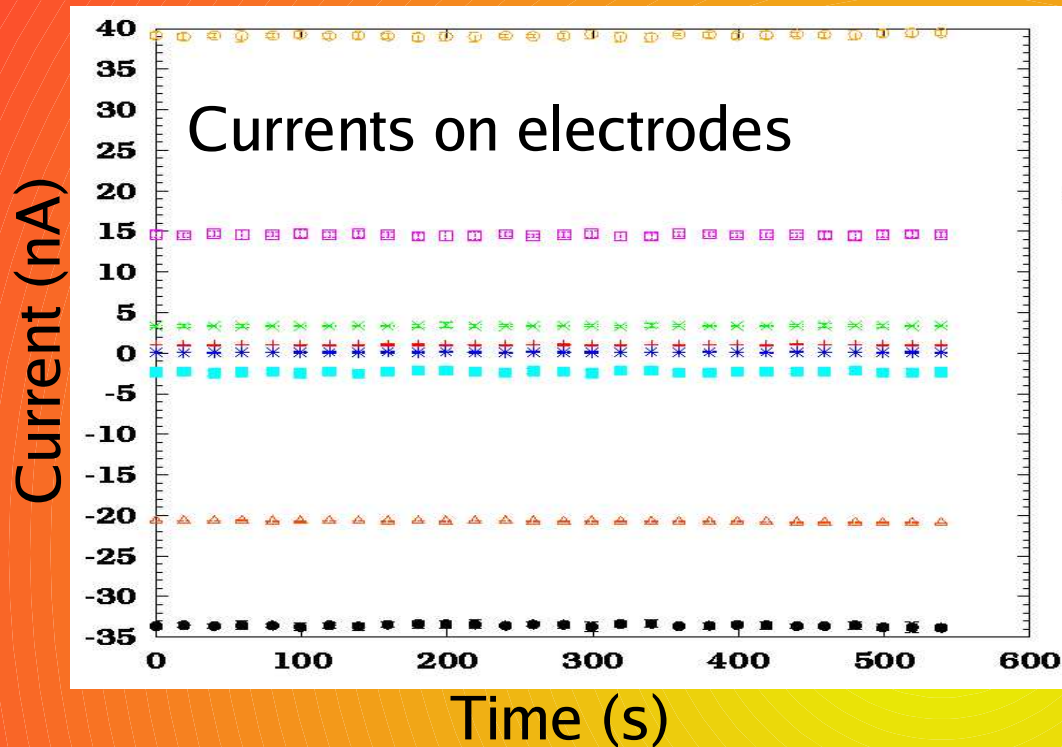


# DESY Test Chamber Setup

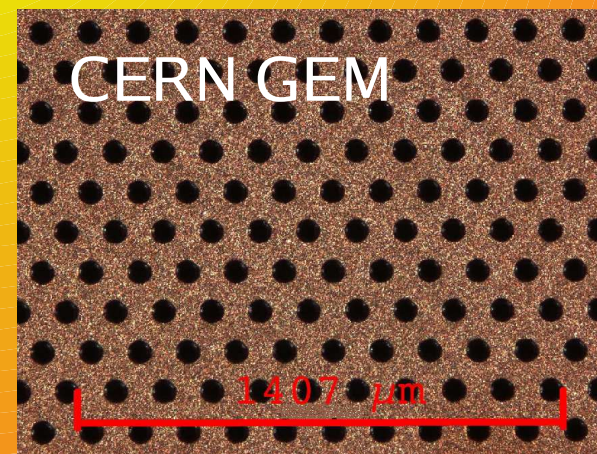
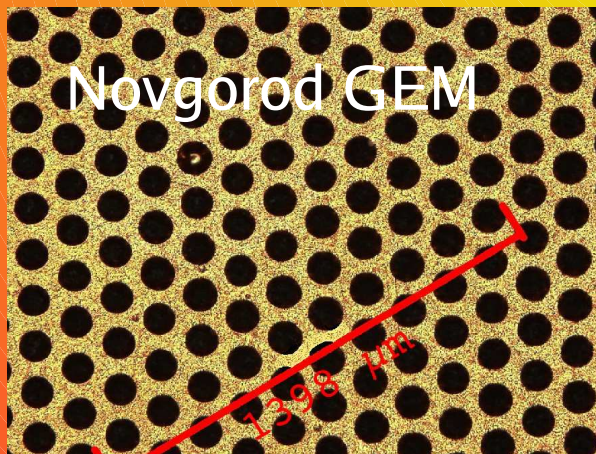




# DESY Chamber Tests



- Verified stable operation
- First "real" measurements with and without magnetic field are about to be done
- Compare findings for CERN and Novgorod GEMs





# New TPC Prototype



- Length 80 cm, diameter 27 cm
- Fits into 5 T magnet
- 2 GEM structure
- 192 readout channels
- Resistor chain tested
- Field cage is about to be glued
- To be finished in May/June
- Laser arrives this month

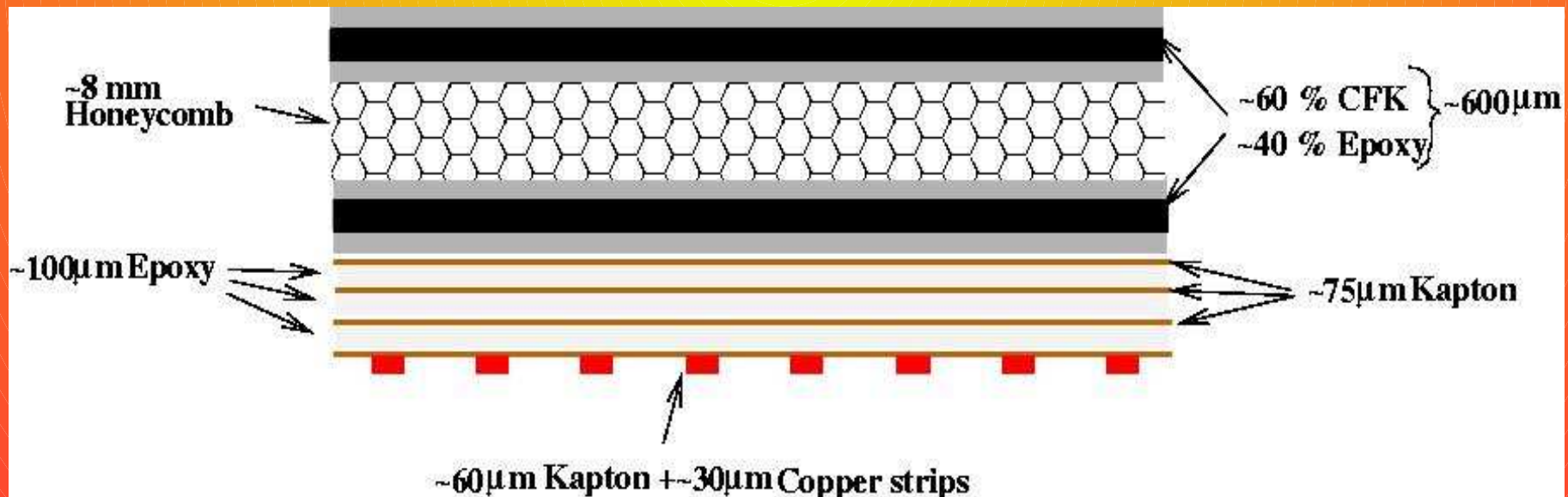
# Field Cage Development

**Goal:** Inner + outer field cage only 3 % of a radiation length

More than a factor of 2 better than for the ALEPH TPC (7.1 %)

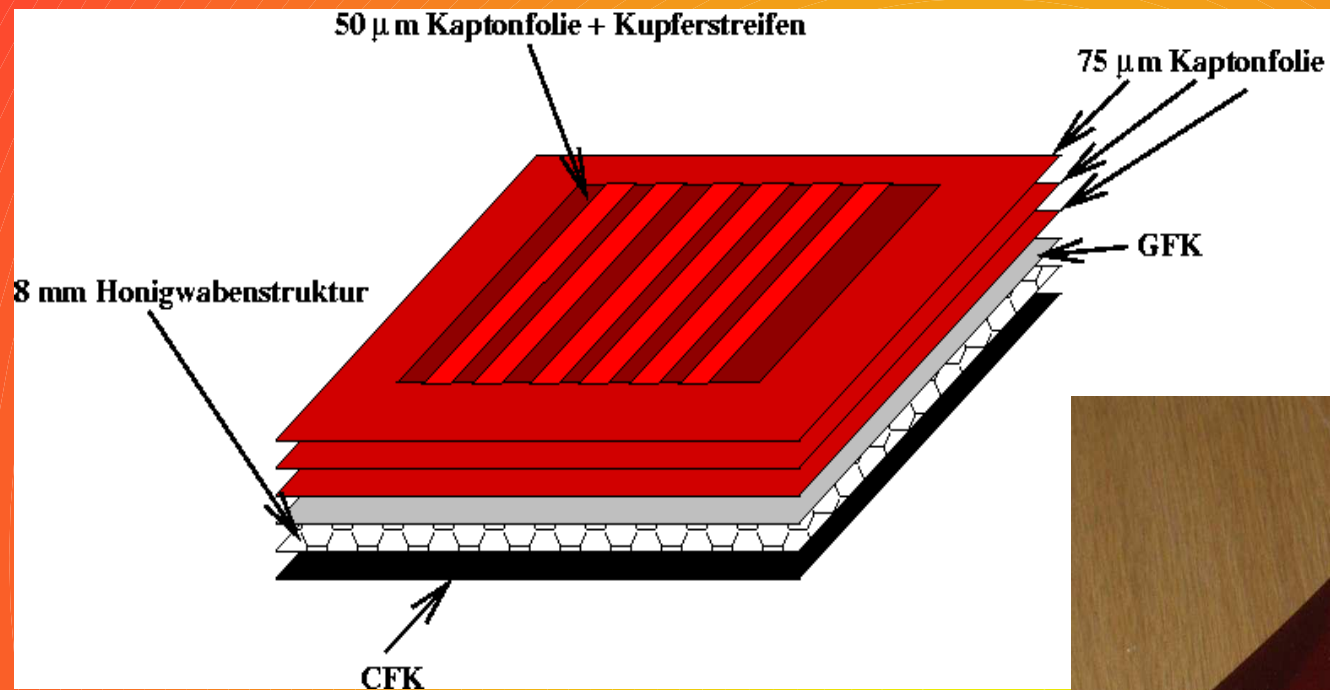
→ **Requires use of sophisticated new materials**

Favourite candidate:

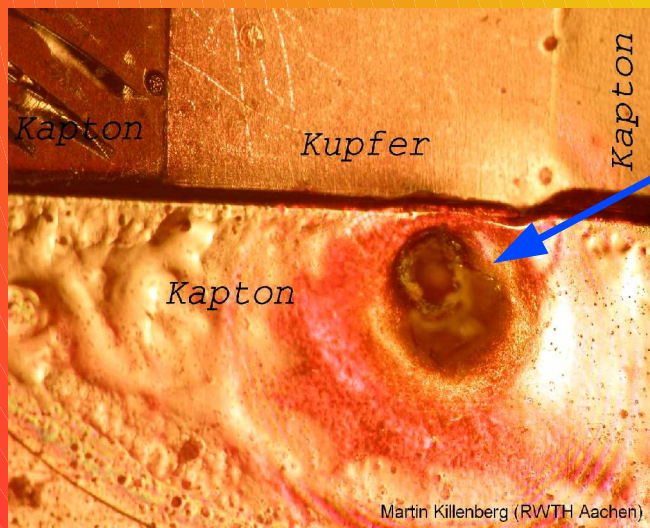




# HV Tests of Field Cage Structure

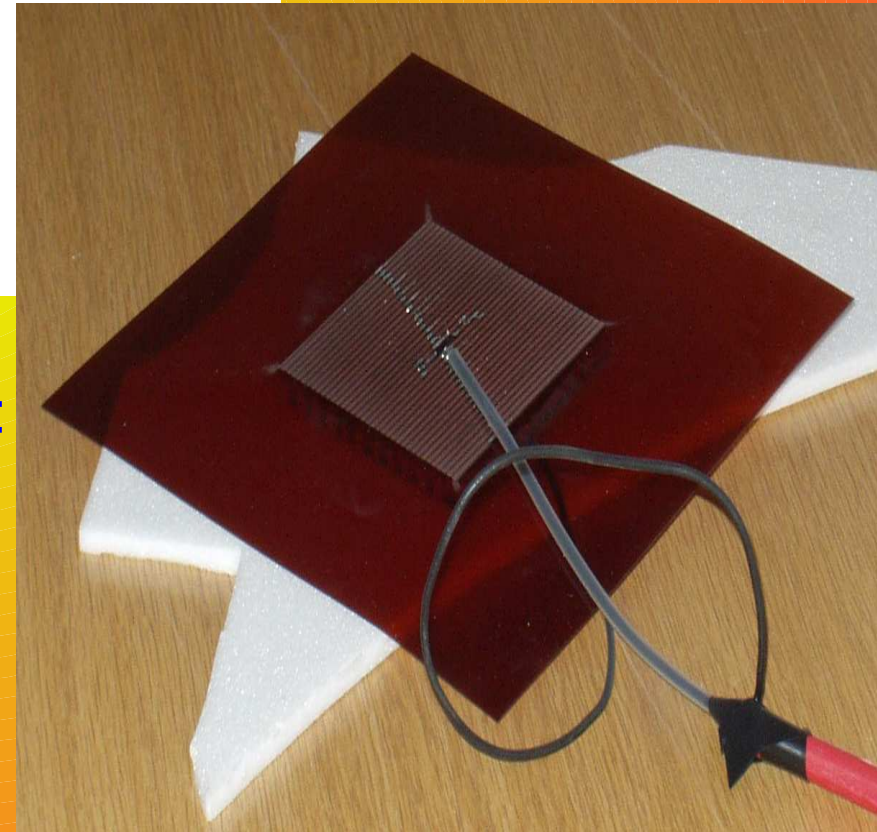


- Applied up to 30 kV between copper strips and outer CFK layer
- **GFK sample passed HV test**



**Failed sample:**

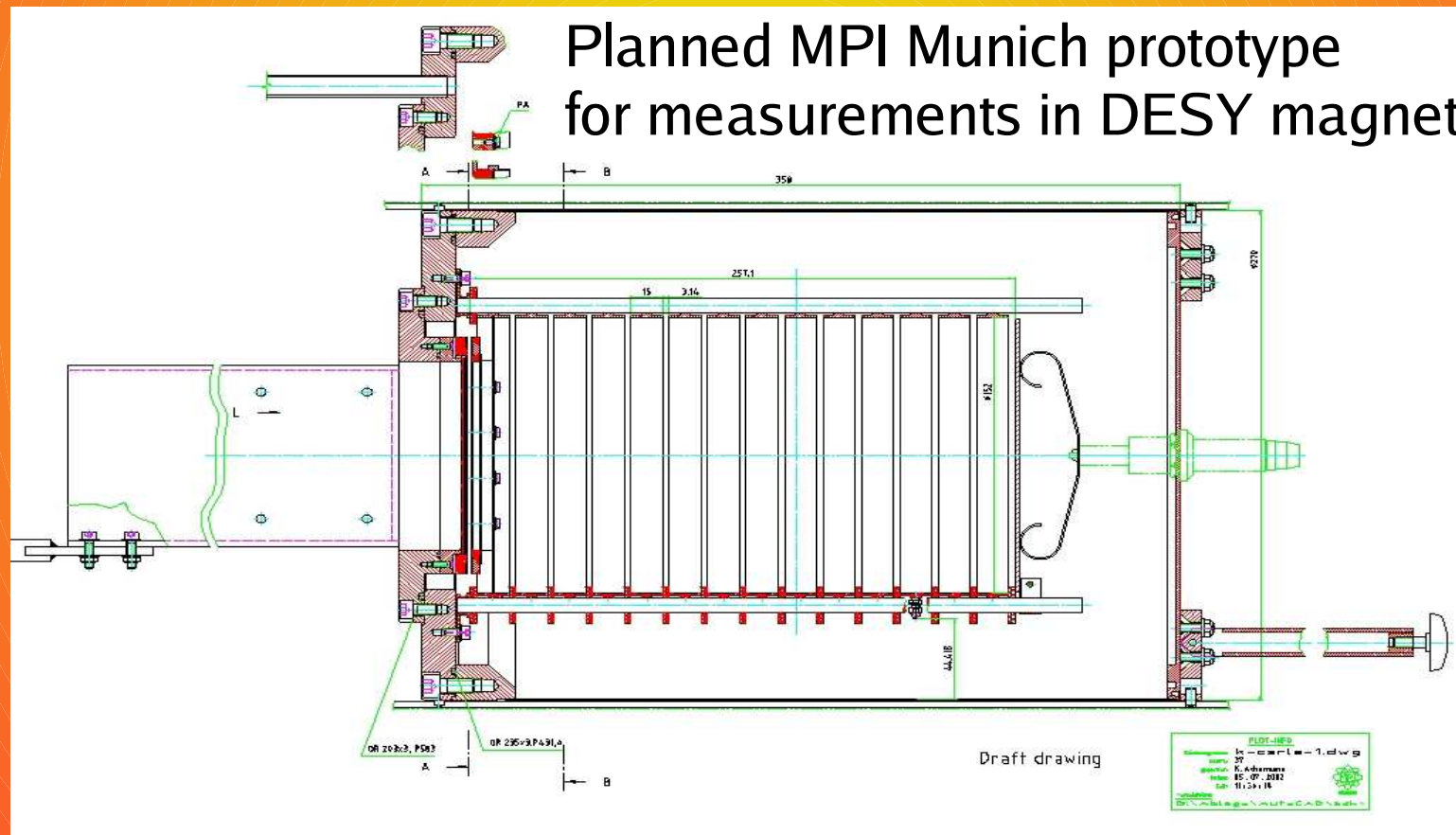
Kapton layer destroyed by spark





# Future Projects in Magnet

In addition to Aachen various other groups plan to do measurements with their chambers in the DESY 5 T magnet, e. g. Karlsruhe, Munich and Victoria



# Summary and Outlook

- The implementation of a threshold in Dean's fit is absolutely mandatory
- First tests with ASDQ chip done, a small TDC based readout will be built
- 5 T magnet is available for TESLA detector R&D, measurements will continue after Easter
- Small test chamber is running stably
- HV stable field cage design has been found, will continue to work on reducing material
- New prototype will be finished in May/June