TPC R&D Activities in Hamburg

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DESY

Hamburg/DESY LC TPC Group:

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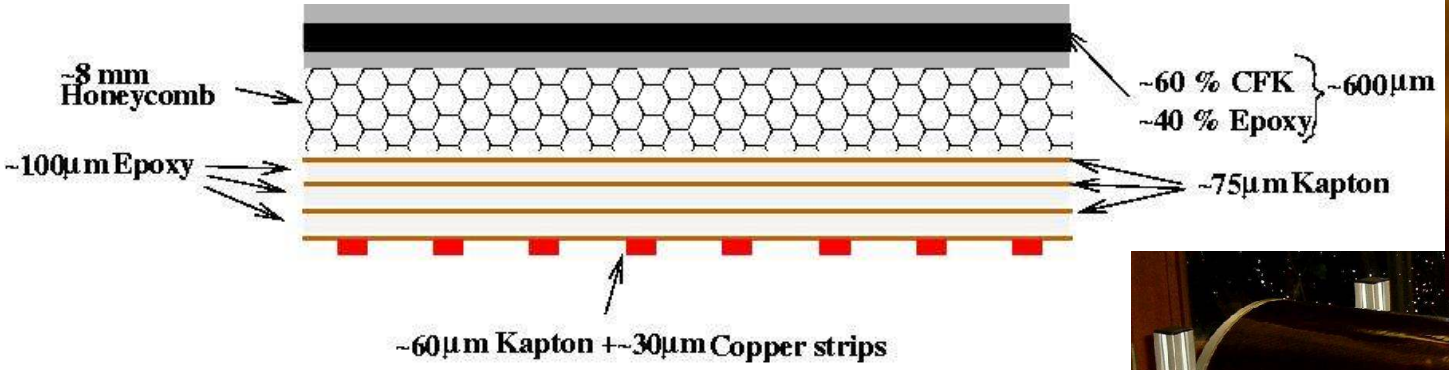
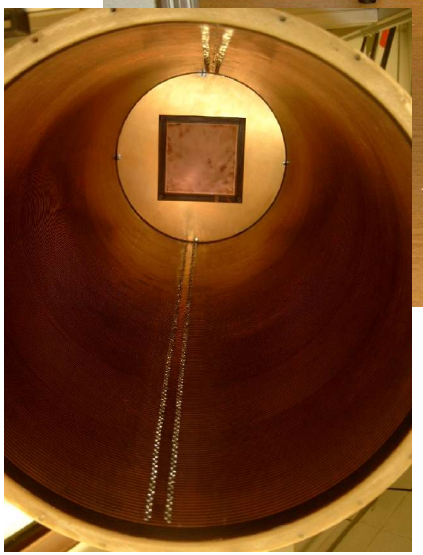
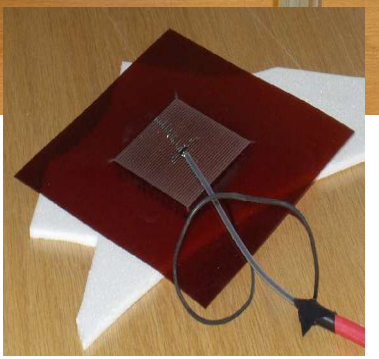
LC TPC R&D Meeting
Lawrence Berkeley National Laboratory
Berkeley, California, USA

Field Cage Development







Prototype field cage with low material budget ready for operation

Tests to be done:

- Check field homogeneity
- Compare with simulation (St. Petersburg, Aachen)
- Optimize strip layout
- Verify longterm HV stability

Further tests with new FC structures for future prototypes are ongoing

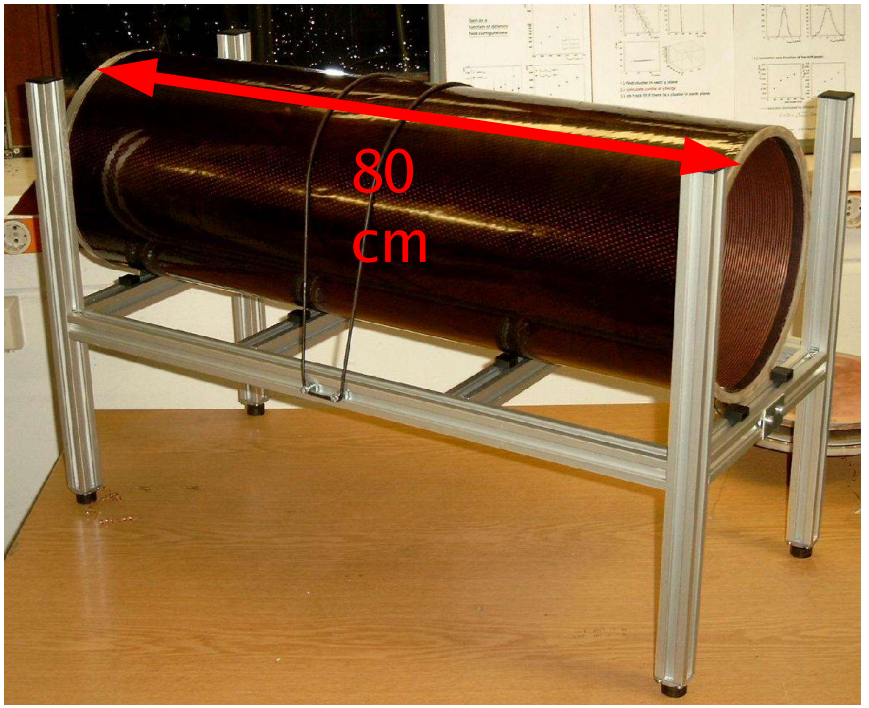
New TPC Prototype

Chamber will be equipped with:

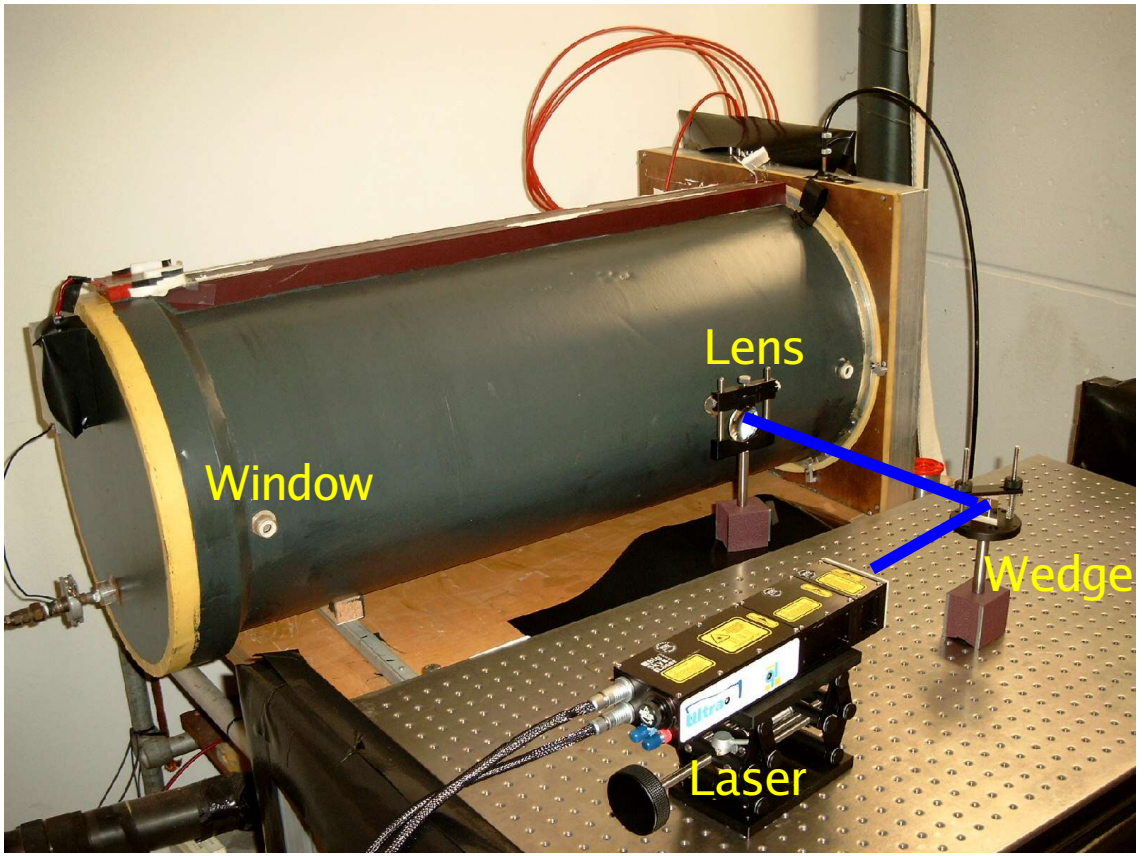
- Double GEM amplification system
- 192 channel readout based on ALEPH electronics

Further plans with new prototype:

- Resolution studies with cosmics in the DESY 5 T magnet
- Prepare chamber for laser system and install a laser system at the 5 T magnet facility
- Go into DESY 6 GeV electron test beam



UV Laser System



Laser characteristics:

- λ = 266 nm
- max. pulse energy = 3 mJ
- energy stability ≈ 5 %
- pulse length < 6 ns
- beam divergence < 1 mrad
- max. rep. rate = 20 Hz

"First light" expected next week

Laser System

Program:

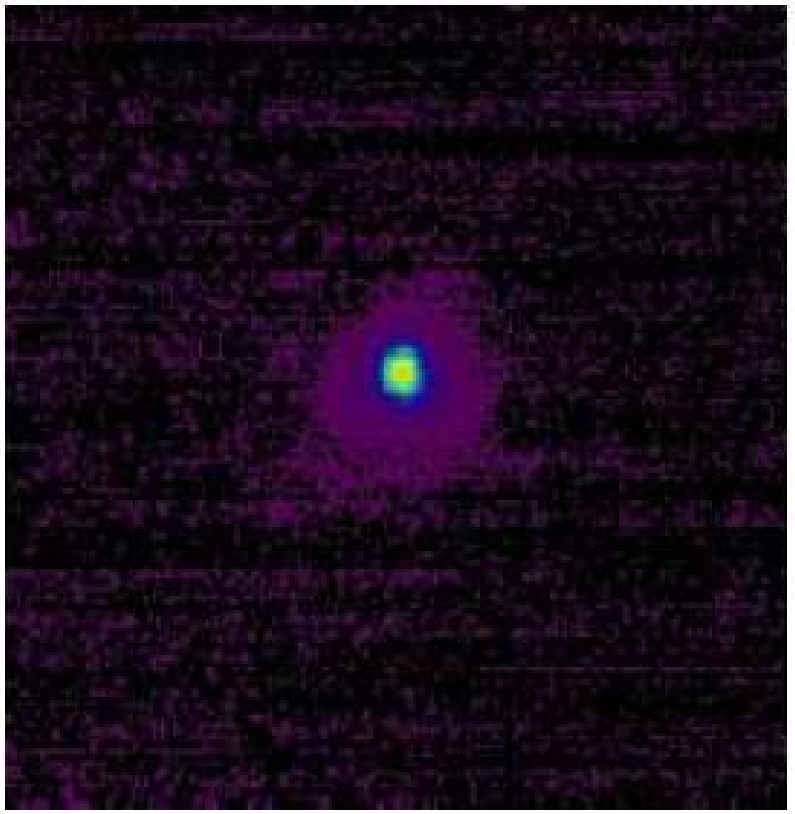
- Measure single point and double track resolution with increased statistics compared to cosmics
- Measure gas parameters (drift velocity, diffusion constants)
- Prepare new chamber for laser system and install it in 5 T magnet facility
- Determine electric field distortions caused by field cage and magnetic field inhomogeneities by magnet

Laser Beam Profile

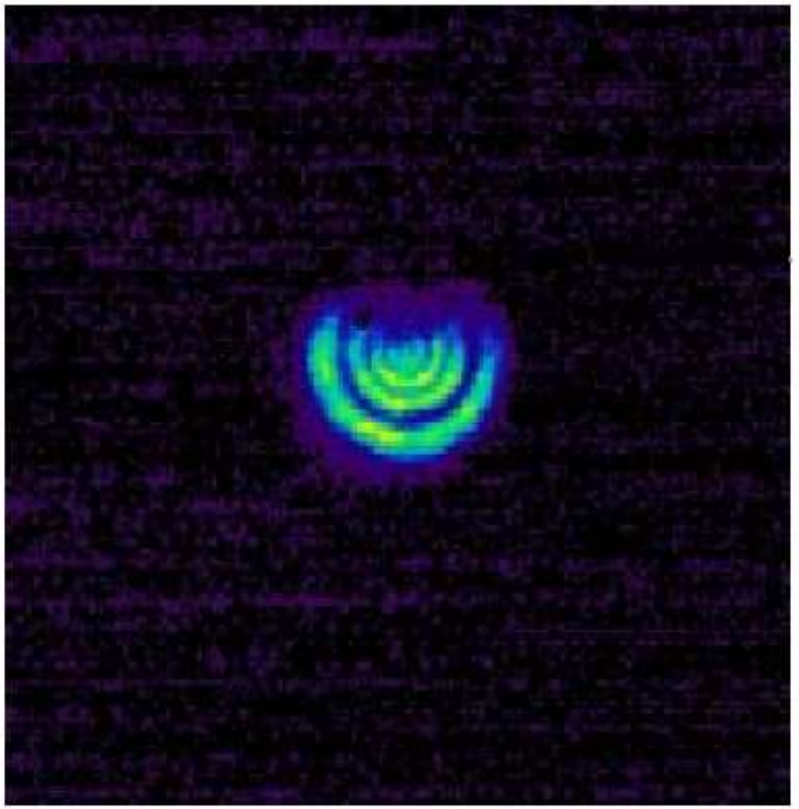
Resolution measurements require unfolding of beam profile

Easy if gaussian beam profile

Far field



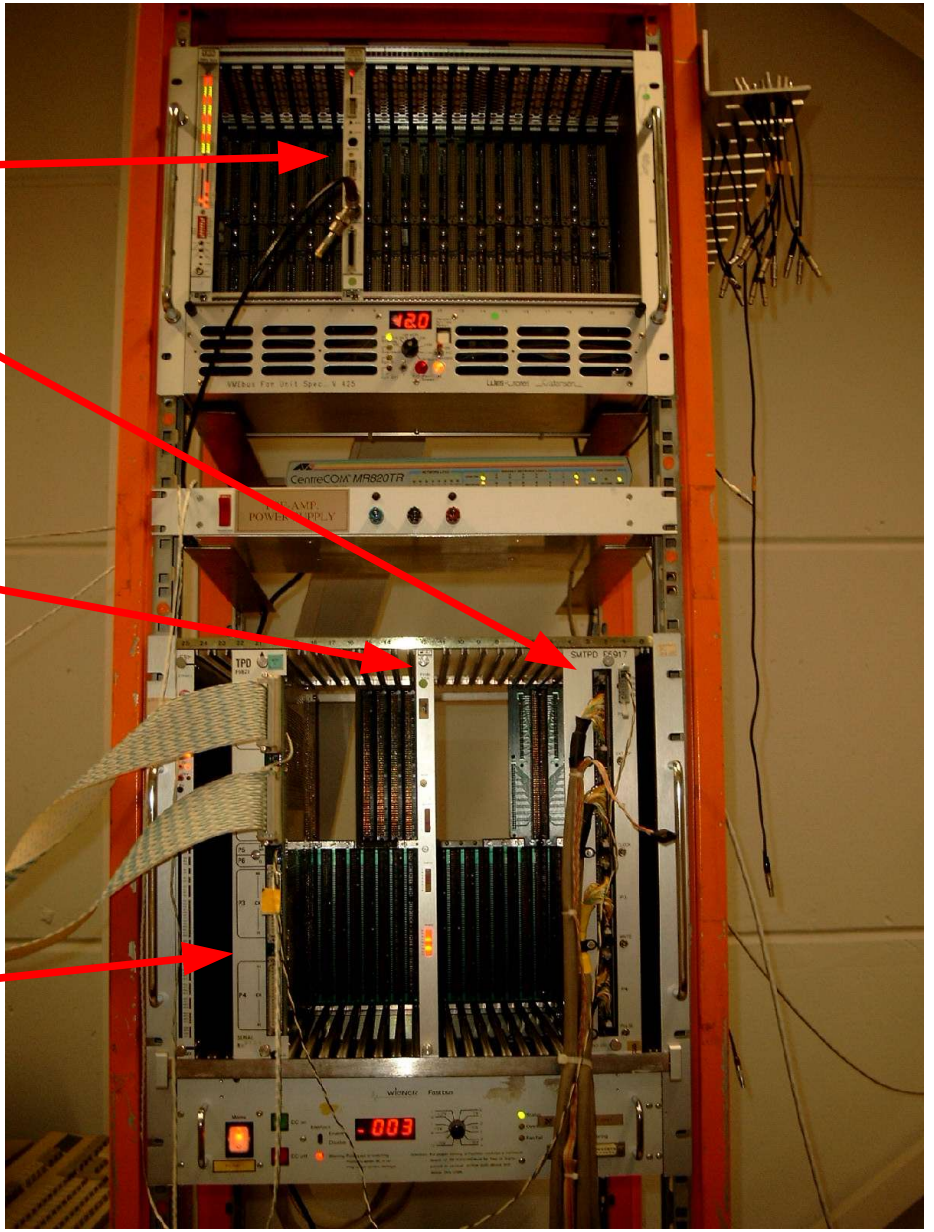
Near field



$\Rightarrow$ Only far field of laser can be used

New Readout Setup

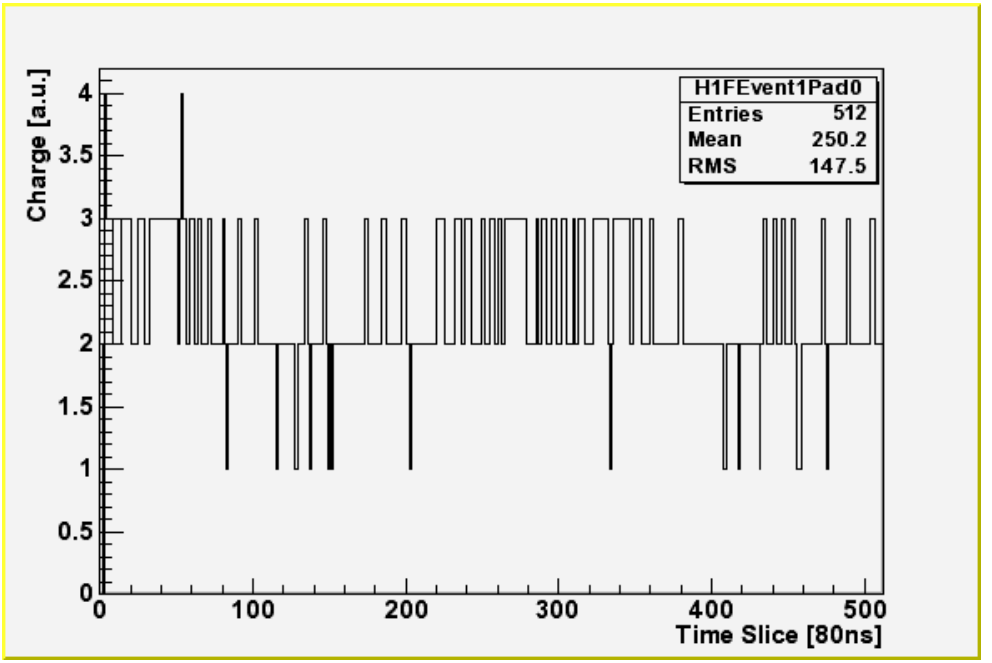
- Old setup controlled by slow Macintosh
- Switched from Mac → VME CPU
- New software allows using advanced TPD features (hardwarewise pedestal subtraction and pulse finding, etc.)
- Available hardware allows setting up several independent copies of this setup



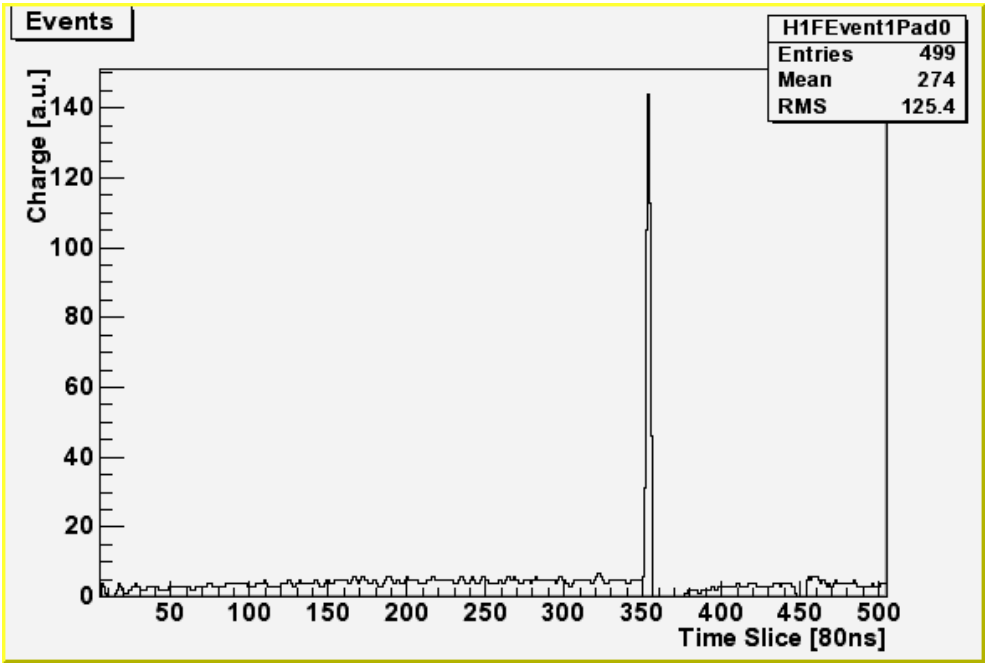
New Readout Tests

Checked new setup using pulse generator:

Noise



Signal

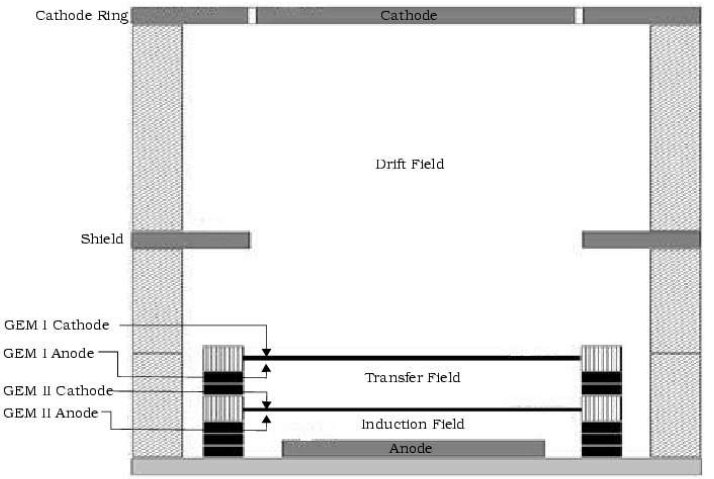


GEM Charge Transfer Chamber

Took first data with Russian GEMs from Nizhniy Novgorod

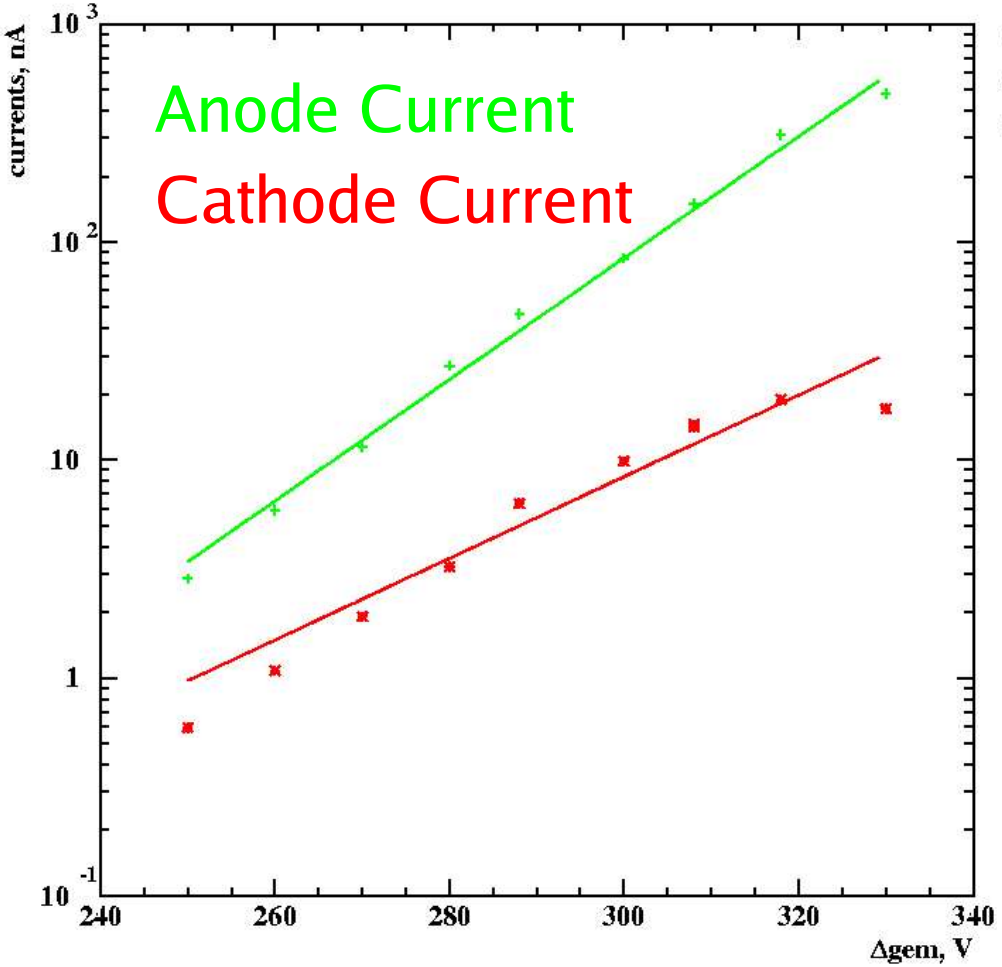
Comparison to CERN and 3M GEMs are planned

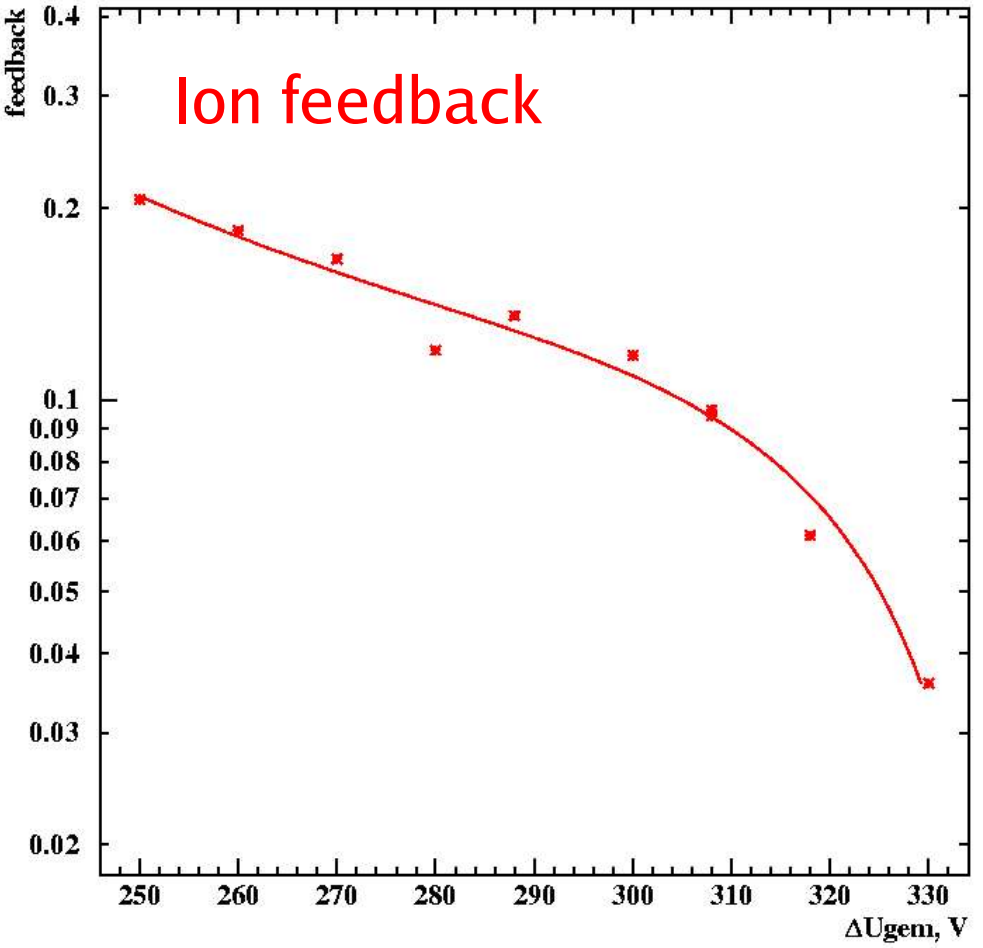
Software changes are required due to replacement of ADC and multiplexer before continuation of data taking is possible



GEM Charge Transfer Chamber

Data with Novgorod GEMs, triple GEM setup, TDR gas:





Summary

Many systems are at the beginning of a (hopefully) successful data taking period:

- New TPC protoype
- Laser system
- New DAQ system
- First measurements with non-CERN GEMs

Interesting quantitative results can be expected for the near future.