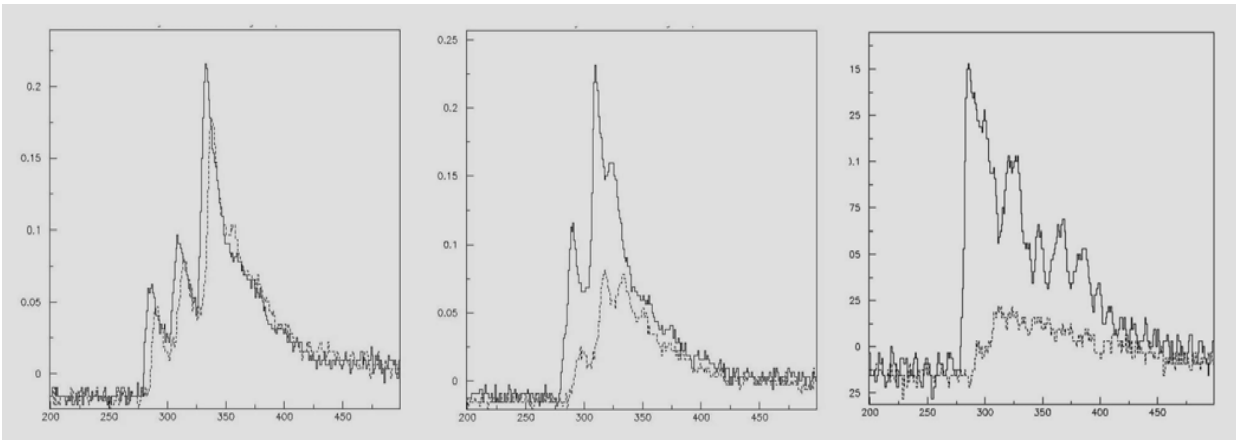
$\mu \rightarrow e\,\gamma$ Drift Chambers

- Charge Division Test Chamber
- Testsetup for Cosmics
- Chamber Construction
- Next Steps

Charge Division Test Chamber

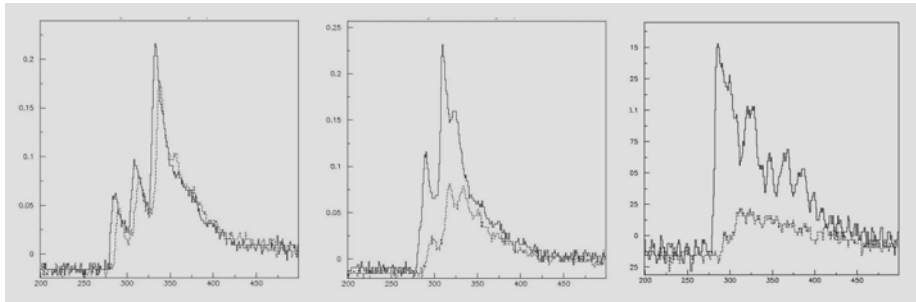
- 1 m long wire, simple construction, He/C_2H_6 (50/50)
- wire read out on both sides
- improved adaption of preamplifier and print (impedance) to suppress reflections
- Sr^{90} source at different positions

examples of charge division (see: Progress Report Dec.2002)



Charge Division - Results

promissing results:

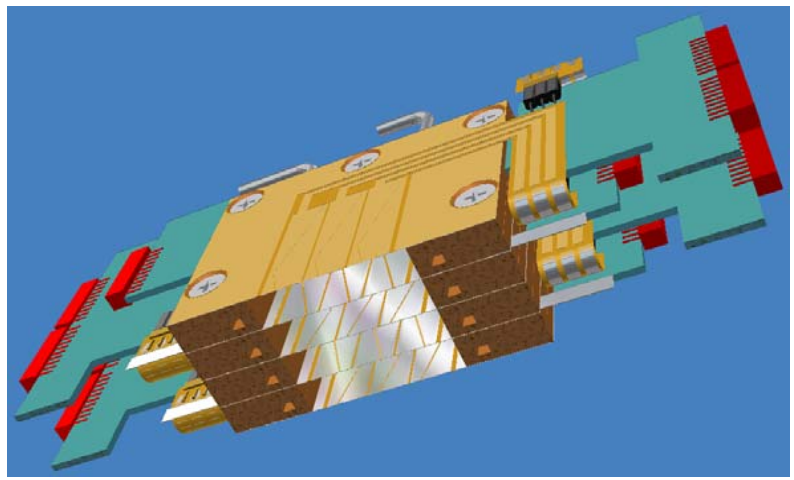


- individual electron clusters visible
- resolution with charge division: $\sigma = 1.5$ cm (steel wire, even with 1900 V)
- 2300 V: signal / noise increases by factor 4
- resolution with steel wire (1200 Ω/m) ~3.3 times better compared to tungsten wire (330 Ω/m)
- measured difference in transit times of the signals along wire: < 1 ns
- development of waveform analyses (baseline substraction, find "t_0", …)
- possibility to compare with simulations (pulse shape, transition along wire)

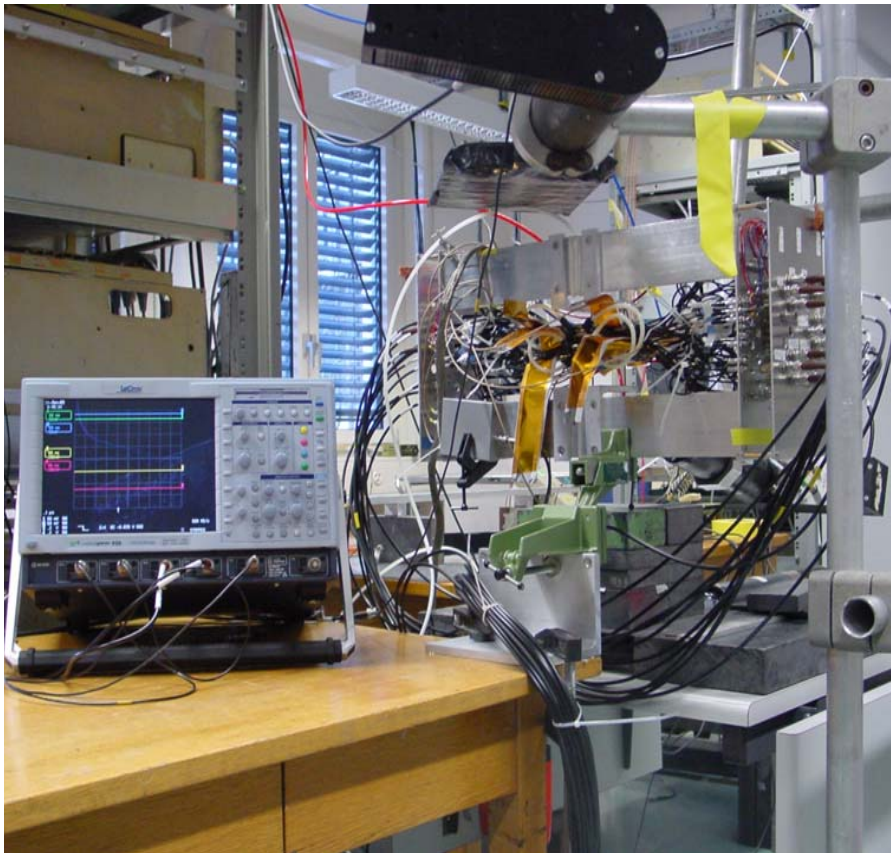
Testsetup for Cosmics - 1

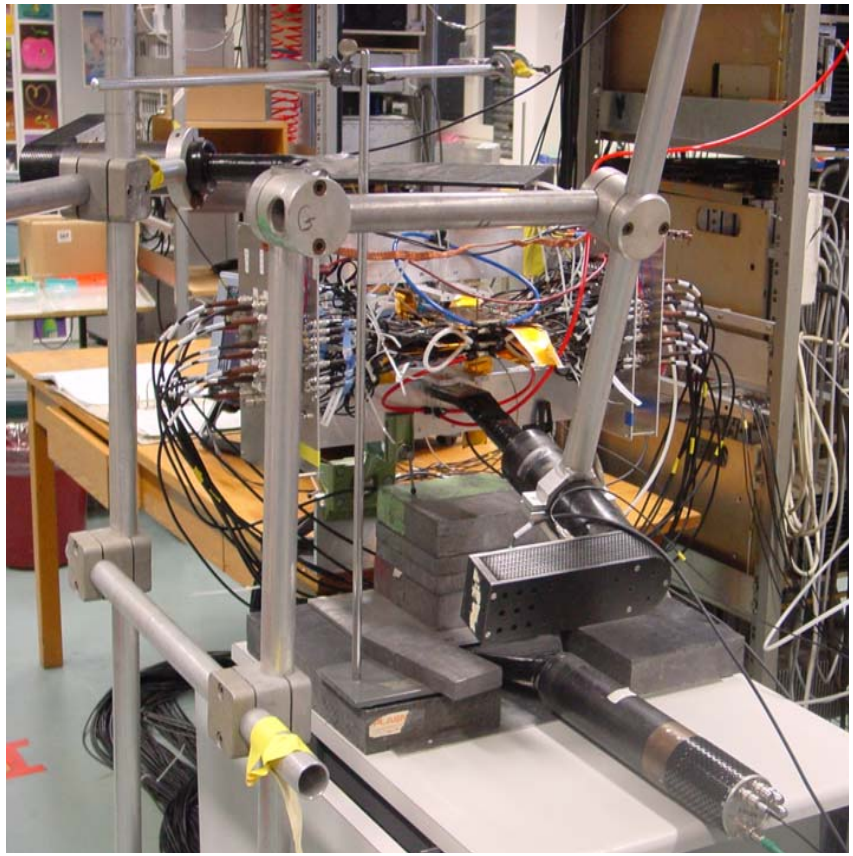
- 4 prototype chambers (8 cm wires)
  mounted piggy-back
- readout channels (oscilloscopes, FADC, ADC):
  chamber 1: 2 anodes, 4 cathodes from the same anode
  chamber 2: 2 anodes, 1 anode on both sides, 4 cathodes from the same anode
  chamber 3: 2 anodes, 4 cathodes from the same anode
  (chamber 4: no HV, 2 cathodes)

  + 4-8 channels (e.g. track identification, different timing)
- coincidence from 3 scintillators
- original cable length
- setup fits to magnet

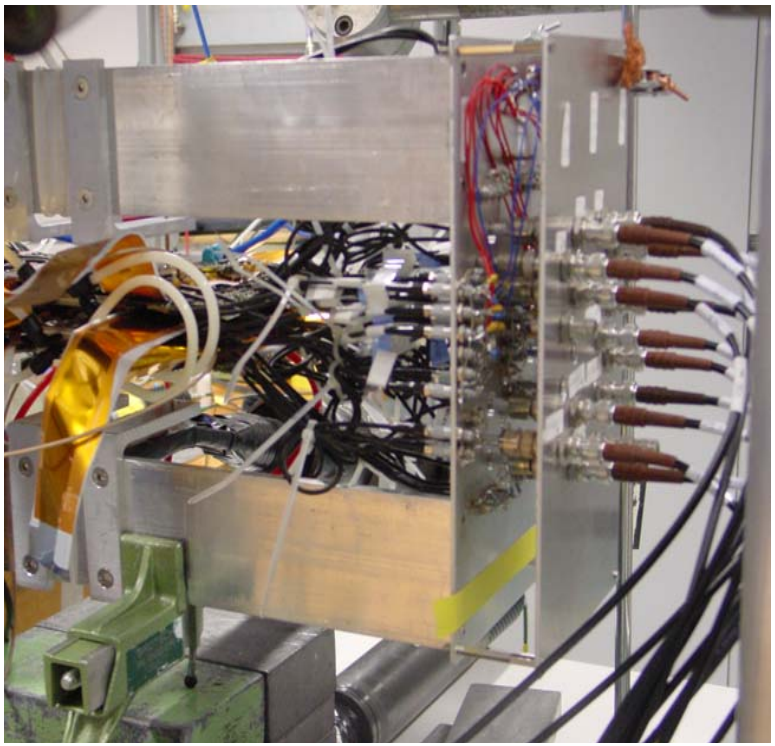


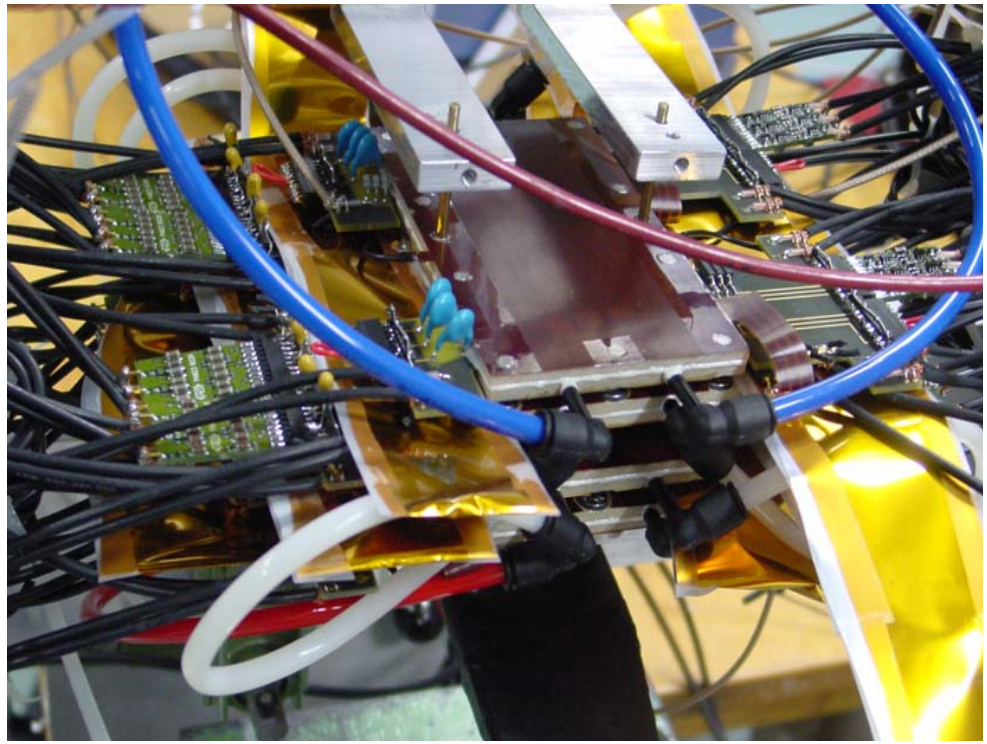
Testsetup for Cosmics - 2





Testsetup for Cosmics - 3





Measurements with Cosmics

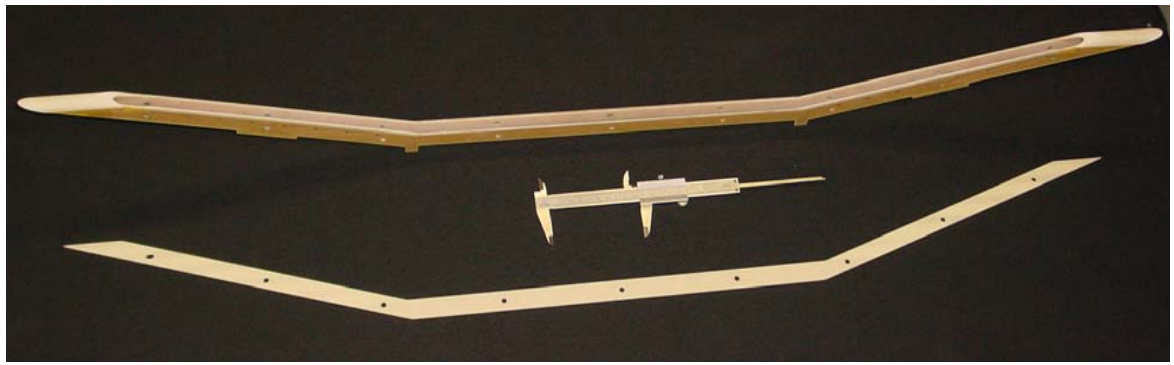
testsetup allows detailed studies of:

- spatial resolution (less multiple scattering than with Sr^{90})
- resolve period of cathode shape $\Rightarrow$ optimize cathode layout
- gas
- magnet field
- optimize preamplifier
  - noise and matching
  - adapt bandwidth
  - sampling frequency of Domino chip
- cross talk (pure preamplifier and print cross talk less 1%)
- further waveform analyses

Chamber Construction

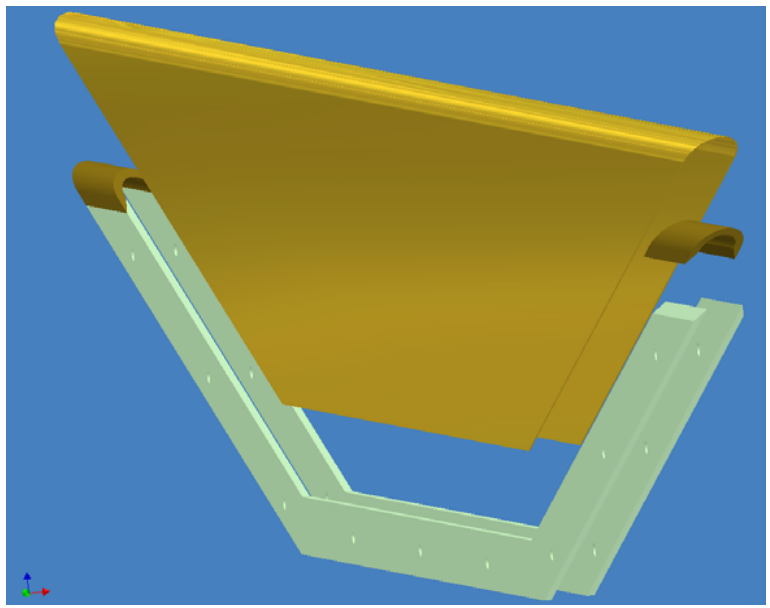
first full size prototypes:

- frame of cathode hood
- cathode support frame



technical drawing of cathode hood:

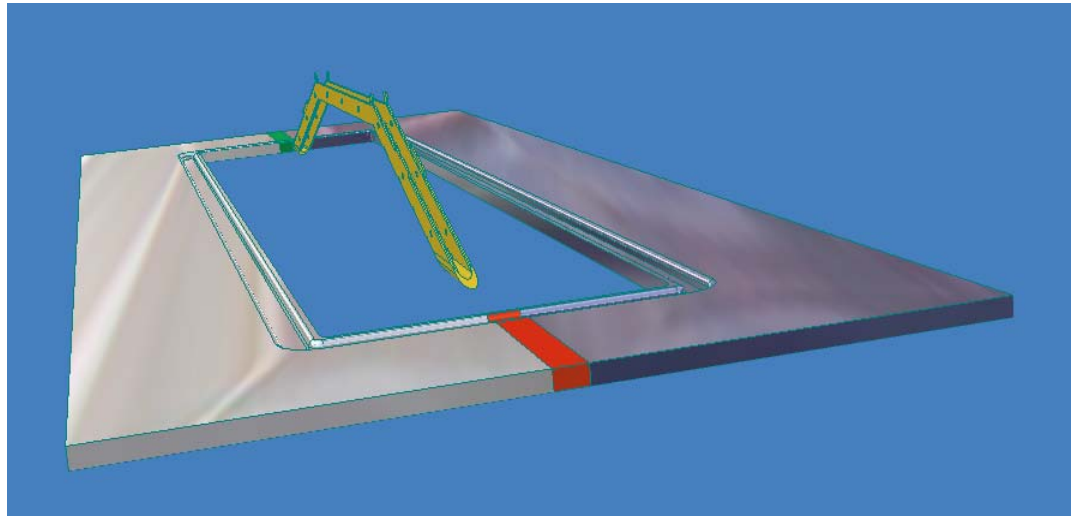
- cathode foil
- frame of cathode hood



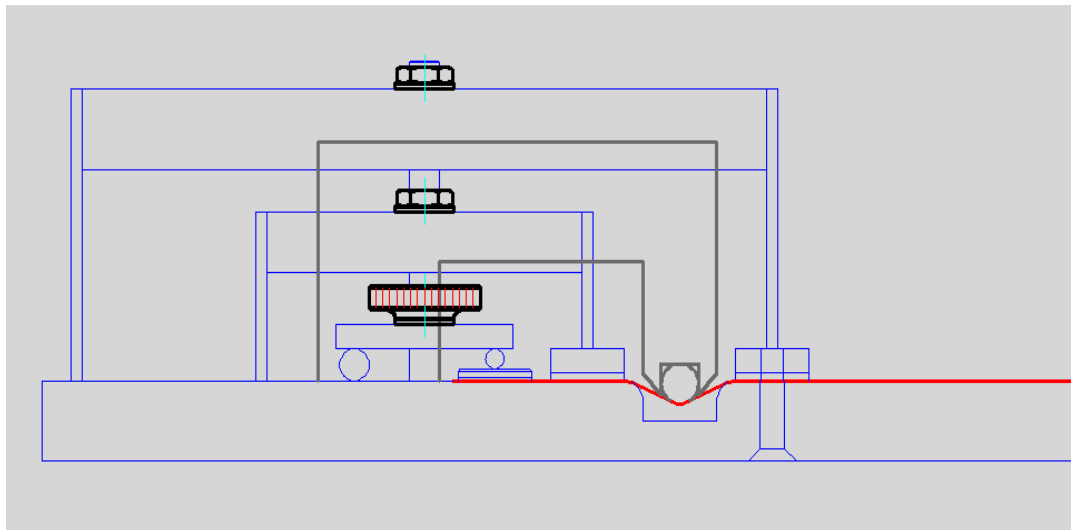
question: how can one stretch and bend the cathode foil?

Construction Procedure - 1

- mount and fix cathode foil on outer part of "takeover frame"

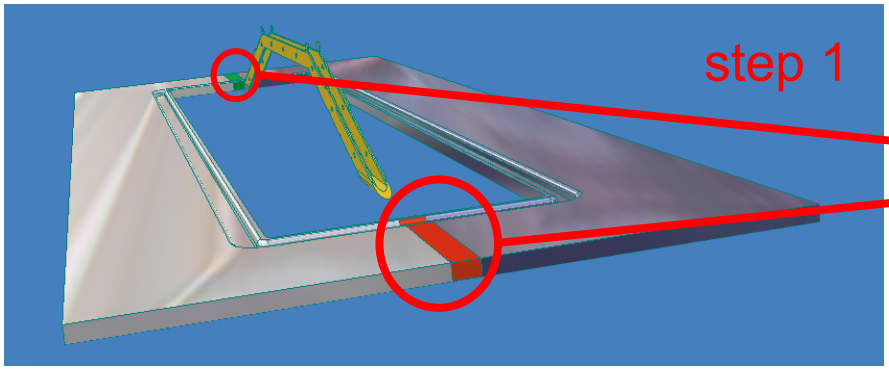


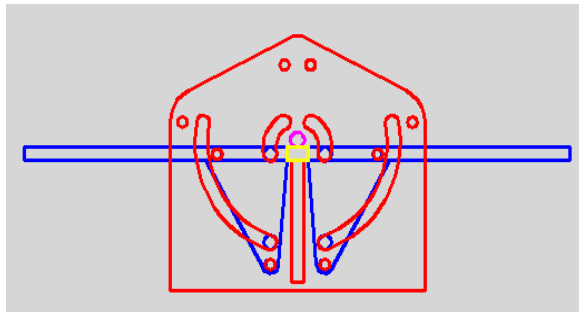
- stretch foil and fix on inner part of frame

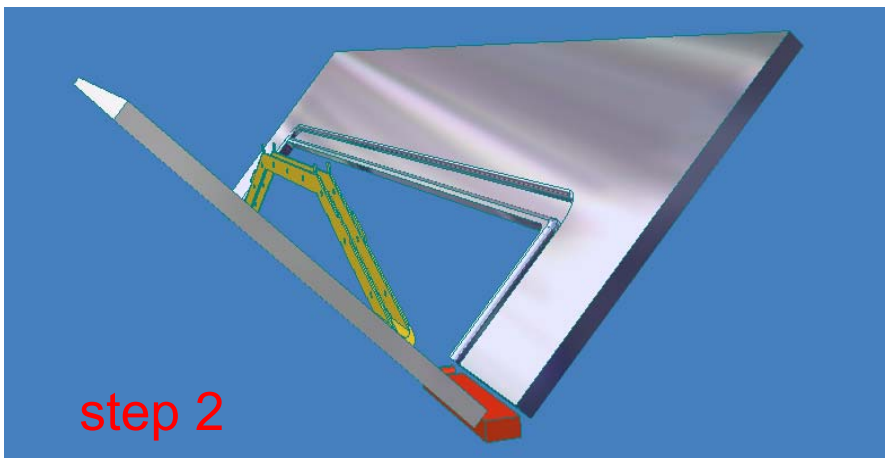


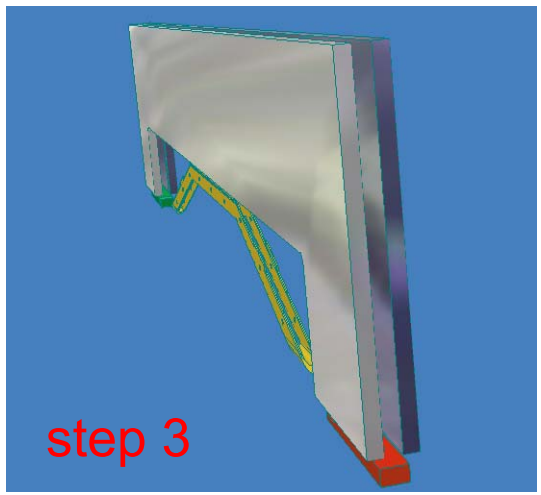
Construction Procedure - 2

- bend “takeover frame” with special hinge and fold it up









Responsibilities

Detector Group will concentrate on:

- further development and construction of drift chambers
- electronics optimization (together with Electronics Workshop, PSI)

In future operation we will “deliver”:

- with each triggersignal: list of ϕ, r, z extracted from waveform analyses

Summary + Next Steps

drift chamber (testsetup for cosmics):

- check and understand setup with Sr^{90}
- develop software for “auto calibration”
- cosmics (spatial resolution, cathode shape, gas, cross talk, …)
- cosmics + Sr^{90}: rate capability, loss of redundancy?
- test in magnetic field (May 2003 ↔ user meeting 05.02.03)
- waveform analyses

electronics:

- adaption of preamplifier (noise, bandwidth, sampling frequency)
- adaption to mechanical contraints

mechanics:

- construction procedure
- full size prototype

} requirement for: → test of full size prototype (complete module) November 2003