

MiniTPC Status Update (16.12.2008)

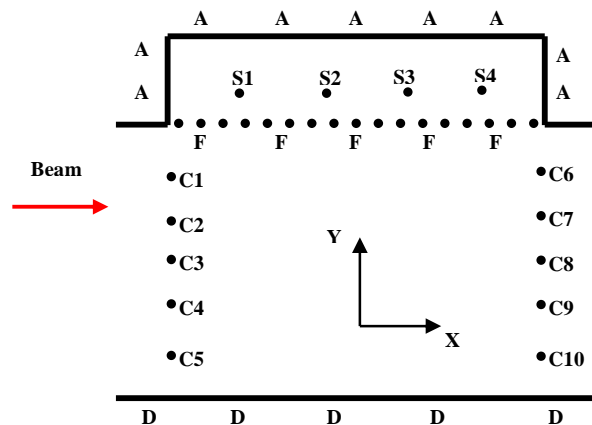
The simulation has been made for two well known gas mixtures:

1. The "light" (low Z) gas mixture used in the MEG experiment (90%He + 10% C₂H₆).
2. The "heavy" mixture used for the PIBETA proportional chambers (49.9% Ar + 49.9% C₂H₆ + 0.2% CBrF₃), which is already available.

The simulation results are in the attached file TPC-simul.pdf .

The design drafts are in the attached files det-6.jpg, det-7.jpg, det-8.jpg .

The miniTPC outer dimensions are 50x50x50 mm³. The MiniTPC has a modular design and consists of two parts: the drift volume and the proportional chamber, divided by a grid. The drift field volume is 50x40x40 mm³ with the maximum drift length of 40 mm. Lateral potential electrodes are used to provide a homogeneous drift electric field.



- A - Cathode
- F - Grid
- C - Potential electrodes
- S - Anodes
- D - U_{drift}

The proportional chamber dimensions are 40x40x6 mm³. The anode-cathode and anode-grid gaps both are 3 mm. The anode wire diameter is 10 or 20 microns. The anode wire step is 10 mm. The grid is made of 50 micron wires with 1 mm step.

The thickness of entrance windows of the detector is no more than 20 microns and the thickness of potential electrodes on them is less than 1 micron of aluminum.

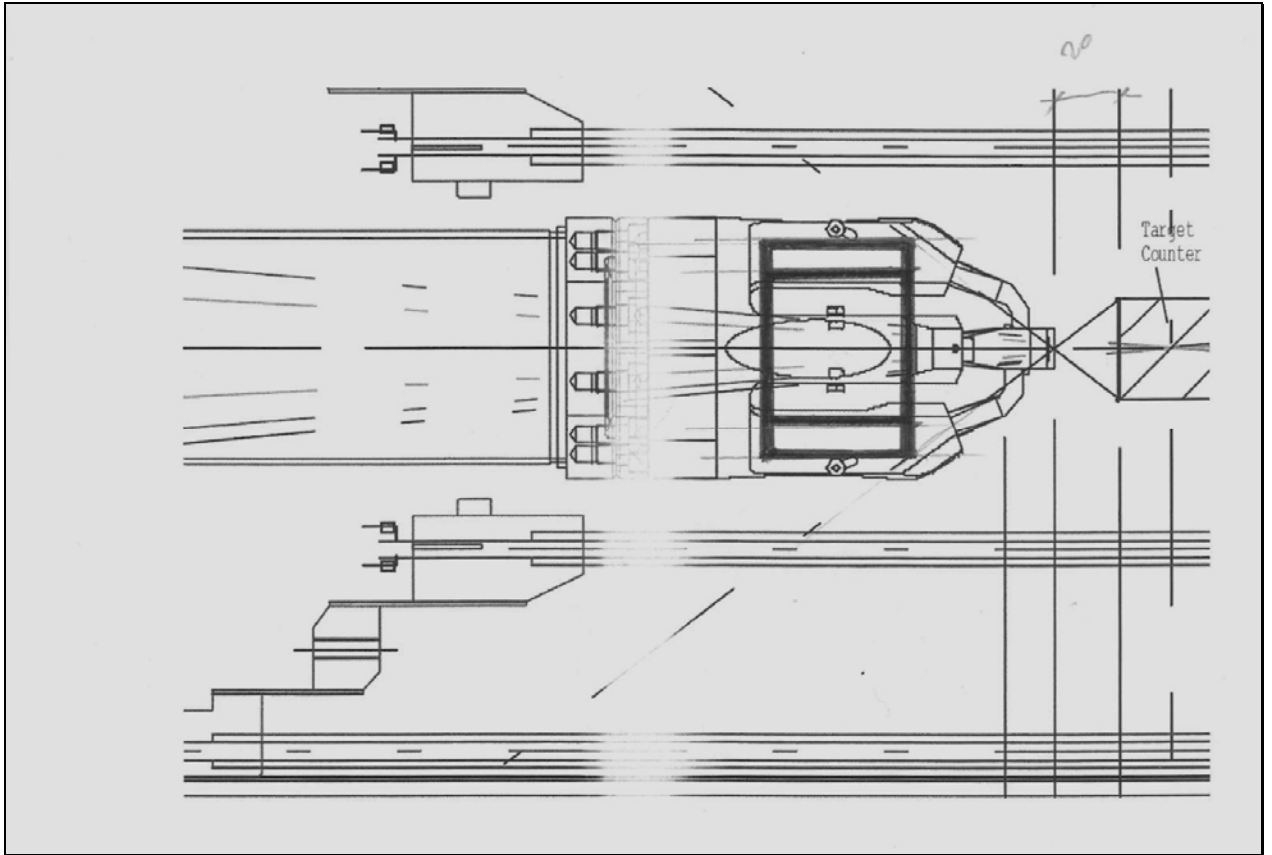
Unfortunately, calculations and results of tests of a prototype have shown on difficulty in implementation of the charge division method for coordinate determination. The problem consists that the minimal diameter of a tungsten wire accessible to us is 10 microns. It gives about 30 Ohm of resistance for a 4 cm long wire. For comparison the nichrom wire used in MEG has the resistance of 2 kOhm per a meter that gives 80 Ohm for our miniTPC. We continue to work in this direction and now we are testing the new amplifiers which can ensure functioning with low input resistance.

As to the paper of F.Bird et al., we studied this possibility earlier and have found that approach inconvenient to us. It would demand carrying out special R&D. And availability of necessary carbon fiber is also questionable for us.

The miniTPC design includes also triangular strips that could be used for coordinate determination in addition to the main charge division method. Under each anode wire on the cathode there is a strip of 40x9 mm with the long side parallel to the anode and cut in two halves along a diagonal. The coordinate is defined by the ratio of the charges induced on the strip halves. As for the anode -cathode 3 mm gap the diameter of the induced charge on the cathode would be approximately 9 mm, there will be no overlapping of charges induced on neighboring strips. The total number of the readout channels of electronics thus remains equal 8 as for determination of the drift time it is possible to take a time mark also from the cathodes.

Work schedule:

- About New Year to complete manufacturing of one detector.
- In the second decade of January to begin tests.
- Work with electronics is simultaneously conducted.
- In the beginning of February we hope to send to PSI the detector for presentation.



The miniTPC placement inside the PEN detector.