

Mini-TPC Project Short Update (31.10.2008)

1. The development of a mini-TPC prototype have been started. In parallel with the hardware development a software simulation using the Garfield program is under way. The simulation would help to optimize some parameters of the mini-TPC (a gap between the electrodes etc.) to obtain a maximal efficiency for the high voltage < 5 kV and the standard gas mixture used for proportional chambers (49.9% argon, 49.9% ethane and 0.2% CBrF_3).

We are considering a mini-TPC with $50 \times 50 \times 50 \text{ mm}^3$ outer dimensions and $40 \times 40 \times 40 \text{ mm}^3$ working volume.

The number of the anode wires is 4(four) with a 10 mm step.

The input windows of the mini-TPC will be made of 20 micron lamsan film.

The first results of the simulation show a large inhomogeneity of the field in the drift region (fields_3.pdf) that should be corrected by introducing additional electrodes and using different high voltages. So the simplest mini-TPC design (fields_1.pdf, drift_2.pdf) does not provide satisfactory detection characteristics.

More detailed results of the simulation will be presented separately.

2. **Information readout**

The first coordinate (a distance from an anode wire) is defined by the drift time. The second coordinate could be found from a ratio of the currents at the ends of the anode wire.

The use of the current ratio method would reduce the number of the channels for digitizing to 8. In that case the anode wire resistance is an important parameter. For an anode wire of a 12 micron diameter and a 4 cm length the resistance would be 32 Ohm what equals to the one of the 30 micron anode wire used in the drift chambers of the MEG experiment.

The other possibilities to measure the coordinate along a wire, e.g. by measurement of a charge induced to the cathodes with varying cross-section (as in the MEG experiment) also were discussed.

3. **Electronics**

As Andries already correctly noted we would need the pre-amplifiers with low input impedance, low noise, good bandwidth and a possibility to use the signal cables of several meters length. To speed up the mini-TPC tests it is possible to use the pre-amplifiers already developed for the MEG experiment. It is also desirable to use some digitizers to register the chamber signals. This would also allow us to obtain 2-D coordinates for every plane from the same digitized data.

4. **Contacts**

Andrey Korenchenko is now at PSI. Nikolay Kravchuk will also visit PSI from November 14th to December 2nd. If it would be possible afterwards they could bring to Dubna 8 channels of the MEG anode amplifiers to speed up the tests.