

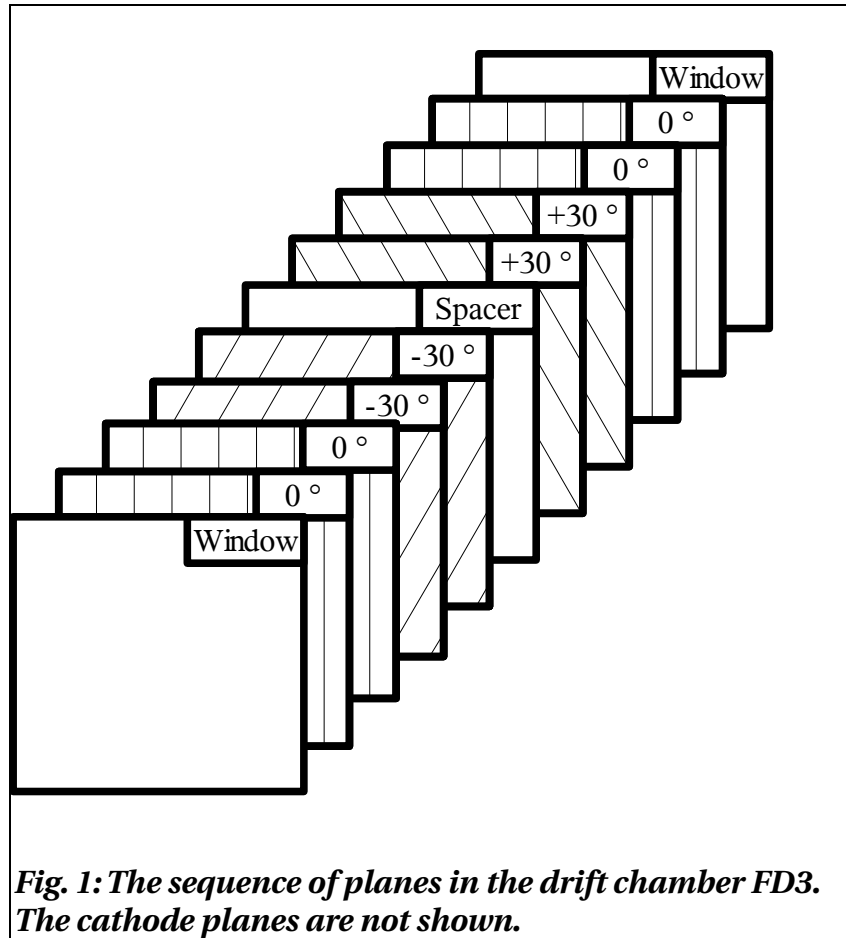
Drift Chambers for the ANKE Forward Detector

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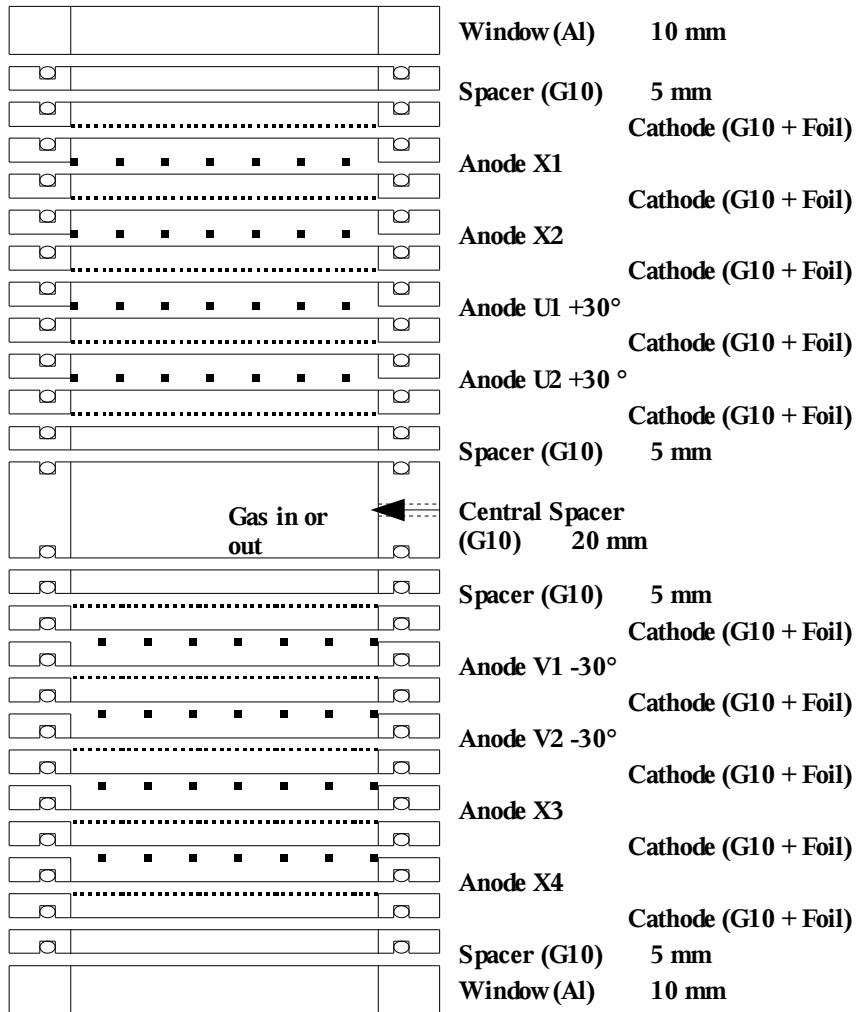
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For the ANKE forward detection system it is planned to replace the proportional chamber FD3 by a drift chamber. With respect to intrinsic geometrical details the chamber is identical with the new 1st forward chamber FD1. Sensitive planes forming drift cells of 10 mm x 10 mm size with anode wires halfway mounted between field wires are sandwiched between cathodes consisting of aluminized Mylar foils. Read out of the anode wires happens with CMP16 amplifier/discriminators boards followed by F1-TDCs.

We propose a chamber consisting of 8 sensitive planes arranged pairwise, see Figures 1 and 2.



Sequence of Planes in Drift Chamber FD 3



Thicknesses:

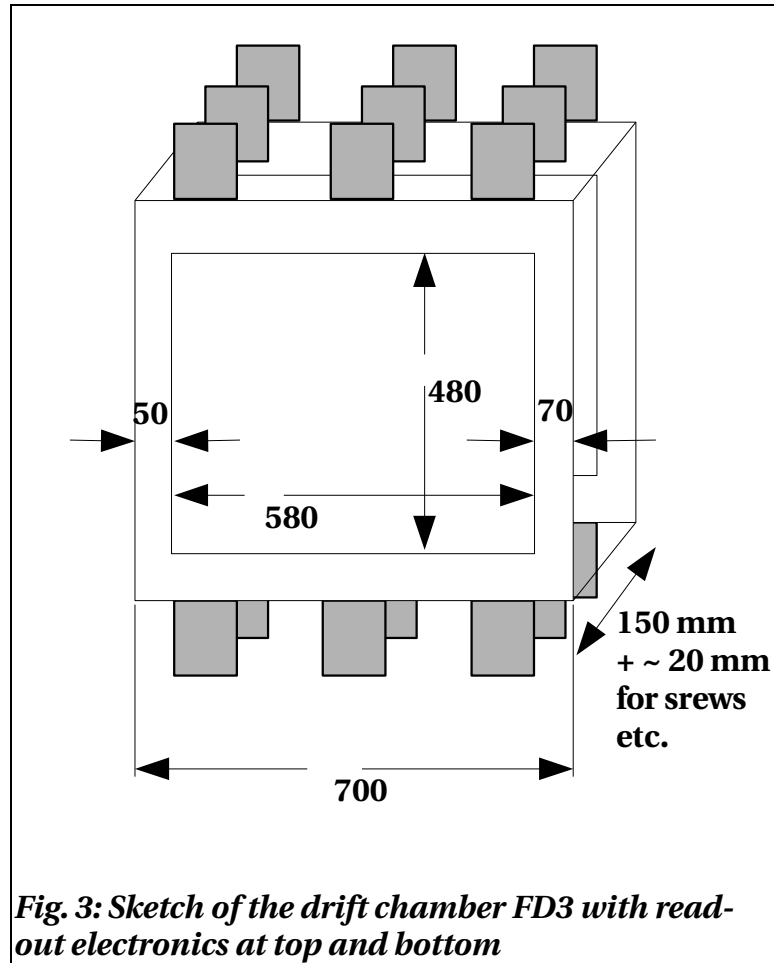
| | | |
|----------------|--------|---------|
| Anodes | 8 x 5 | = 40 mm |
| Cathodes | 10 x 5 | = 50 mm |
| Windows | 2 x 10 | = 20 mm |
| Spacers | 4 x 5 | = 20 mm |
| Central Spacer | 1 x 20 | = 20 mm |

Total thickness of the Drift Chamber = 150 mm

Fig. 2: Horizontal cut through drift chamber FD3 (schematic)

The size of the new chamber

The existing FD3 chamber has an active area of 523 mm (hor) x 390 mm (vert). In the new chamber an increase to approx. 580 mm x 480 mm is possible due to reduction of the width of frames and due to the fact that no read-out electronics is located along the sides of the chamber as sketched in Fig. 3. The outer dimensions of the chamber have been included by E. Heßler into the Anke FD drawings and found to fit.

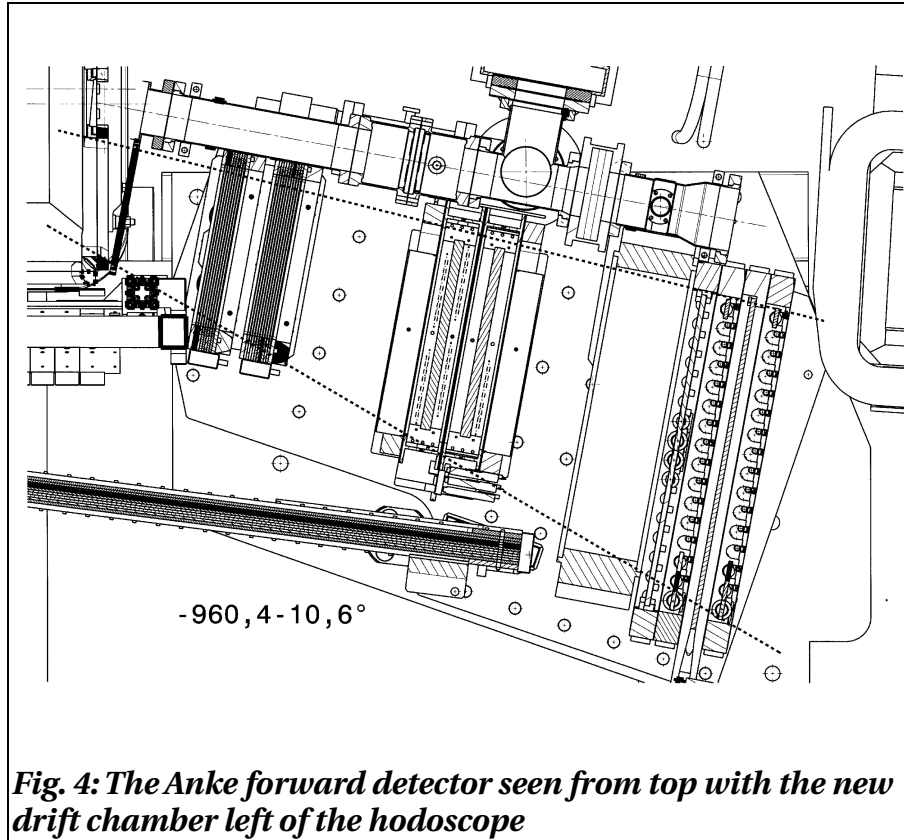


With this chamber installed instead of the existing proportional chamber FD3 full acceptance of the forward system as defined by the forward hodoscope and the exit window of the vacuum chamber can be exploited, as indicated by the dotted lines in Fig. 4.

Read-out electronics

Readout electronics for the new chamber consists of chamber-mounted CMP16 amplifiers/discriminators coupled with F1-TDCs. This concept has been successfully applied to various chamber types at Anke and at WASA. In contrast to the version currently applied at Anke the analog threshold and supply voltages will no longer be delivered directly by the F1-board. While the CMP16-board itself remains unchanged, an additional adapter module is placed very close to the chamber. Threshold setting then is done via a serial connection from F1. Mass production of CMP16 modules has started. The adapter module is in the prototyping phase.

For the new drift chamber together with the FD1 drift chamber one full crate with F1-modules is needed. The missing modules will be made available by the Cosy-TOF/Panda-straw group once they have obtained new GPX-TDCs.



Data analysis and optimization of the position resolution

The analysis of drift-chamber data still needs further development. With drift chambers with the same intrinsic geometry like the new one cosmic measurements are being performed in the laboratory in order to optimize gas mixtures and to collect data as a basis for testing tracking algorithms.

Finances

Major components for the chamber (fiberglass plates, W/Au wire, electronics components) have been purchased and paid. For precision mounting of wires gadgets have to be built (approx. 5 000 €). To be financed are also the labor costs for finalizing analog electronics and related electronics (approx. 3 man-months). A big fraction of the costs is due to digitizing electronics (F1 and a crate).

Time schedule

The time needed for fabricating the new chamber is estimated to be at least 1/2 year and it cannot yet be fixed precisely on the level of months. Availability of machine time in workshops, manpower limitations for our technicians due to other projects and uncertainties due to the development of new techniques can easily add several months. In any case, the installation of the new chamber must happen together with the installation of the new forward hodoscope in order to make efficient use of shut-down time at ANKE. The hodoscope should be made available for cosmic tests of the new chamber for a period of about 1 month before installation at Anke. In particular during this time in addition to the authors of this paper support for tracking analysis is urgently needed.

Further plans

The drift chamber FD1 consists currently of two separate modules with vertical and inclined wires, respectively. We intend to combine these modules to a single chamber thus saving space and reducing acceptance limitations.

The prototype straw chamber near the forward window of the Anke vacuum chamber will be replaced by a chamber which can be mounted directly on the window frame. Then it is fixed within the coordinate system of D2 and adds an important data point to the track analysis.

To be decided

Detailed work can start as soon as we have agreement about the size of the chamber. The active area of the proposed chamber is larger than that of the old FD3-MWPC. The dimensions are limited by the size of existing fiberglass plates which were selected such that we have enough freedom to reduce existing acceptance limitations. While we can still gain one or two centimeters horizontally the vertical size given in Fig. 3 can certainly be somewhat reduced.