Additional drift chamber for the COSY–11 facility

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The COSY–11 facility uses two planar drift chambers for measurements of trajectories of positively charged reaction products which are deflected in one of the COSY dipole magnets towards the center of the COSY ring. The chambers cover only the upper range of momenta of the outgoing particles. It is planned, therefore, to install along the dipole magnet an additional drift chamber extending the momentum acceptance of the COSY–11 spectrometer towards smaller momenta. This chamber will allow one to measure for example the π^+–momenta in the reaction $pp \rightarrow pp\pi^+\pi^-$ near threshold. It will also increase the detection efficiency for kaons, due to its smaller distance to the target.

The new chamber contains hexagonal cells (see Fig. 1), identical with the ones which are used in the central drift chamber of the SAPHIR detector [1]. The drift field in this type of cells has approximately cylindrical symmetry, and thus the distance to drift time relation is independent of the particles' angles of incidence. In order to minimize the multiple scattering on wires, gold–plated aluminium [2] is used for the 110 μm–thick field wires. The sense wires are made of 20 μm–thick gold–plated tungsten. As chamber gas a mixture of 50% argon and 50% ethane at atmospheric pressure is used. The sense wire potential is about +1800 V, whereas the field wires are all grounded.

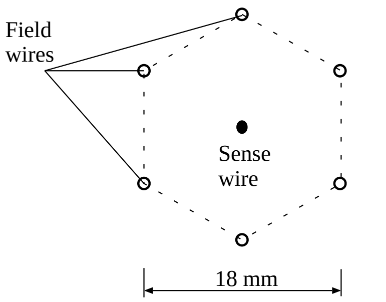

Figure 1: Cell structure.

The cells are arranged in the detection plane as shown in Fig. 2. The chamber consists of three detection planes with vertical wires, two planes with wires inclined at -10^o and two with wires inclined at $+10^o$. This arrangement makes it possible to reconstruct particle trajectories in three dimensions, also in cases of multi-track events. The chamber contains 3x80=240 and 4x77=308 cells with vertical and inclined wires, respectively.

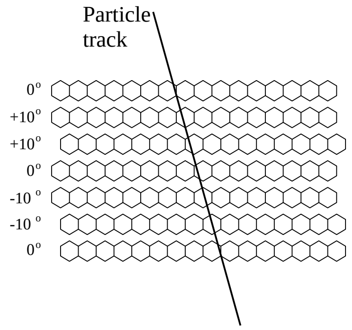

Figure 2: Orientation of wires in the seven detection planes of the chamber.

The wires are stretched between two aluminium plates and are positioned by means of sockets with inner openings of $\phi = 50$ μm and $\phi = 150$ μm for the sense and field wires, respectively. The wires are fixed in the sockets by means of small wedges. The sockets are inserted in ϕ=2 mm holes drilled in the aluminium plates. The plates are supported by two U-shaped frames (see Fig. 3). More stable rectangular frames were excluded due to space limitations, however, the applied frames are rigid enough to hold the total load of 290 kg originating from the mechanical tension of all wires. The active area of the chamber is 1500 mm wide and 400 mm high. The installation of the chamber at the COSY–11 facility is foreseen for summer of 1999.

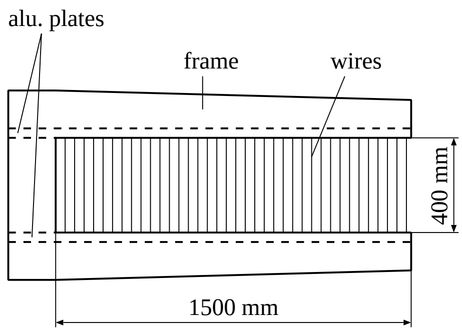

Figure 3: Front view of the chamber.

References:

[1] W. J. Schwille et al., Nucl. Instr. and Meth. **A 344**(1994)470

[2] California Fine Wire Company, Grover Beach, California, USA