Test and Installation of Multi Wire Proportional Chambers used as Luminosity Monitor

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A new luminosity monitor has been developed for the experiment COSY-11 to register elastically scattered protons at high counting rates. It consists of two delay line multiwire proportional chambers [1] placed above and below the beam pipe downstream of the cluster target. Both chambers have two cathodes consisting of 72 wires with a pitch of 1.5 mm and daisychained by 4 ns delays. The anode which is supplied with high voltage is placed between the cathode layers and consists of 36 wires separated by 3 mm. Both chambers have an active area of 10×10 cm^2. They are operated with the same gas used for the COSY-11 drift chambers: a mixture of 50% argon and 50% ethane with purity better than 99.95% and bubbled through methylalcohol. A stable operating voltage for this gas mixture is 3250 V. The trigger is done by a coincidence of two scintillators following each chamber.

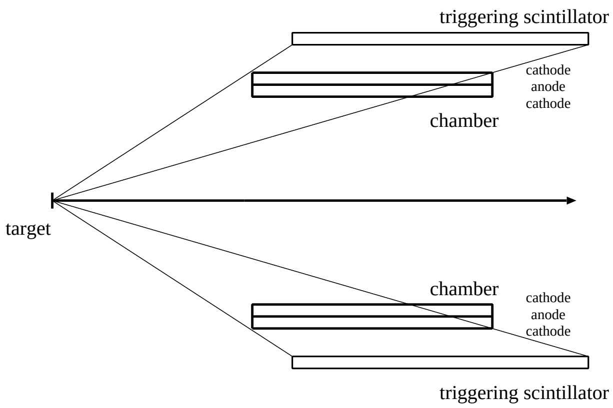

Figure 1: position of the chambers

First tests have been performed with cosmics. Two scintillators covering the active area above and below the chambers were triggered in coincidence. A third coincidence with a little movable scintillator (diameter 2.5 cm) selected a small part of the active area only. By moving this scintillator a spatial dependent functioning of the chambers was established.

To determine the spatial resolution in a more precise way we installed the two chambers between the two COSY-11 drift chambers [2] which have a known spatial resolution of 220 μm. The expected position of the hit in the chamber was calculated from the drift chamber data and compared to the measured hit position. Preliminary results show that the resolution (sigma) is about 0.3 cm due to multiple scattering in the 8 mm thick aluminium plates covering the wire chambers. This is sufficient for the chambers' purpose.

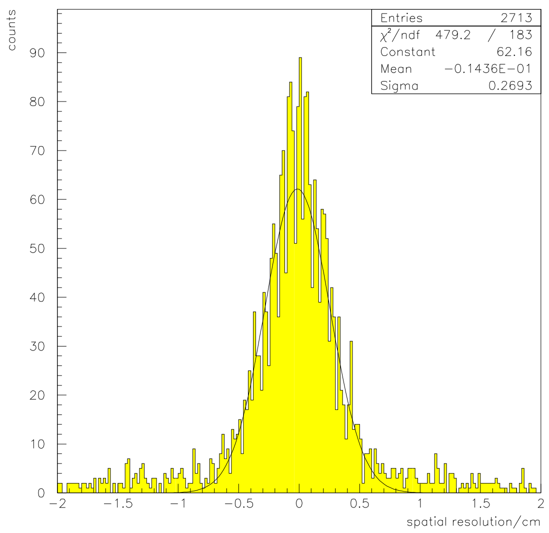

Figure 2: spatial resolution

The chambers were installed at their final position for the COSY-11 beamtime in October/November 1997. The analysis of the data show the same results as expected from Monte Carlo simulations. The counting rates of a single chamber increased from 1/s without a target to 100/s with the cluster target [3] switched on.

First coincidence counting rates have been observed, however, a final geometrical adjustment of the system has to be done before significant measurements can be taken, which we expect to do early 1998.

References

[1] G. Charpak, F. Sauli, Multiwire proportional chambers and drift chambers, NIM 162 (1979) 405-428

[2] S. Braucksiepe et al., NIM A 376 (1996) 397-410

[3] C. Quentmeier, Aufbau eines Clustertargets und systematische Untersuchungen zur Clusterproduktion, Diplomarbeit, Institut für Kernphysik, Münster, Jan. 1997