Test of a Prototype of a new Q3D Focal Plane Detector using a Microstrip Gas Counter on a Glass Scintillator ◇

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A new design of a focal plane detector for the Munich Q3D magnetic spectrograph consists of a microstrip structure evaporated directly on special scintillating glass HED-1 (Schott) [1,2]. The light output of the scintillating glass defines the pulse height of the energy-rest signal for particle identification. The detector was tested for the first time with deuteriumn beam in the ^{128}Te(d,p) reaction.

To adapt the detector to the bent focal plane of the Q3D several segments of ≈ 10 cm were put together in small angles. This is necessary to get the sharpest line width over the whole active length. A high position resolution, better than 0.1 mm, is possible by the readout of three coupled anode strips with a effective width of 3.5 mm and a fit to the charge distribution for every single event. Working readout electronics from another detector of our group is used [3].

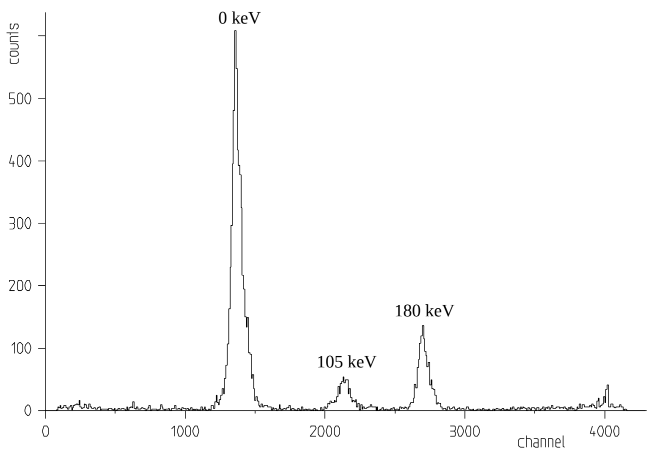

Fig. 1: Position spectrum of the ^{128}Te(d,p)^{129}Te reaction at 20° with 24 MeV deuterons and 28 MeV protons.

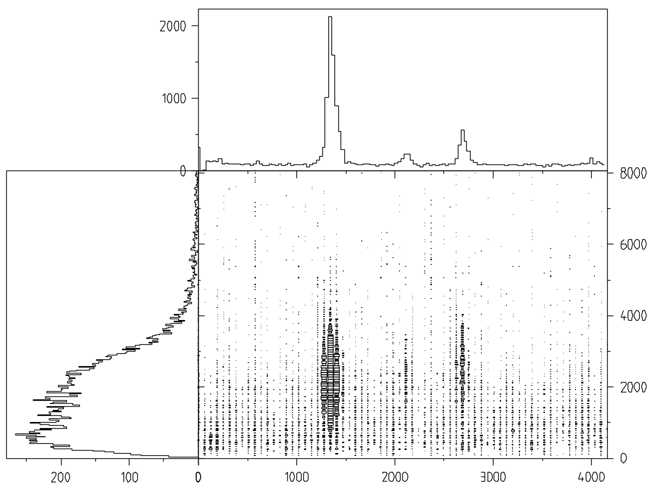

Fig. 2: Energy-rest vs. position spectrum. In the projections one can see the three peaks of fig.1, but also the insufficient separation of the protons in the energy-rest signal

The position spectrum of the ^{128}Te(d,p)^{129}Te reaction obtained in the last test run is shown in fig. 1. The distance of the drift foil to the microstrip plane on the scintillator was 19 mm, which guaranteed the appropriate charge distribution on the anode strips. Fig. 1 demonstrates that our microstrip gas counter on scintillator glass is working. The achieved FWHM of 13 keV will be improved in the next run. It is mainly due to the displacement of the detector with respect to the focal plane and the 160 μg/cm^2 thick target.

The main problem is the insufficient energy separation (fig. 2) in the energy-rest spectrum between protons, deuterons and other background. This would be essential for good particle identification and background-free spectra.

Detailed investigations of the scintillation behaviour of the glass substrate showed that the light yield is about 15 times smaller compared to common Ne 102A. The applied wavelength shifter reduces the light output additionally by a factor of four. The new design proposed for the light collection of the glass scintillator is shown in the lower part of fig. 3.

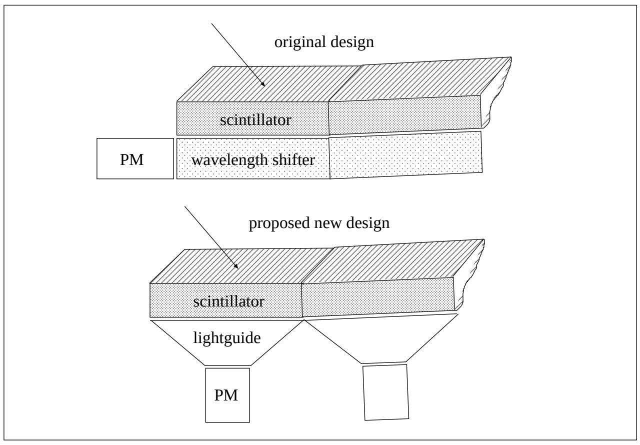

Fig. 3: Original and proposed new design of the light collection for the energy-rest signal.

References

[1] W. Schauer, Ph.D. thesis, TU München, 1997
[2] W. Schauer *et al.*, Jahresbericht 1993, p. 209
[3] J. Ott *et al.*, Nucl. Instr. Meth. **A367** (1995) 280.

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