Efficiency of the second scintillator plane of the ANKE forward detector*.

P. Fedorets[a], M. Büscher, V. Chernyshev[a], S. Dymov[b], V. Komarov[b]

The aim of this work is to determine the efficiency of the second scintillator plane of the ANKE forward detector(FD) for the a_0^+ beam time (Jan./Feb. 2001). We used data from 4 runs 3347, 3348, 3350, 3352 obtained with on-line "trigger 2", i.e. a signal from the first scintillator layer of the FD. For track reconstruction the information of the FD MWPCs 1 and 2 was used and only events with a single reconstructed track were accepted for the analysis.

For the suppression of scattered background (i.e. from the vacuum pipe between D2 and D3) geometrical criteria were applied [1]:

- Horizontal and vertical limitation of the track coordinate on the D2 exit window.
- Vertical cut on the target ($Y'Y$ distribution).
- Horizontal and vertical limitation for the track coordinate on the scintillator surface.

Furthermore, events with only one cluster per each wire plane in FD-MWPCs 1 and 2 were selected. This allows to reject multiparticle events with only a single reconstracted track.

The surface of the second scintillator plane was divided into cells of 5x5 mm^2. The coordinate of the crossing point was calculated from the MWPC information. The criteria of the hit was the presence of time signals from both photomultiplier tubes. If the crossing point is closer than 6 mm to the edge, the possibility of a hit in the neighbouring counter was allowed (the accuracy of the crossing point coordinate is about 5 mm and 1 mm is the mean gap value).

Figure 1 shows the efficiency of the second hodoscope plane. Over the whole surface it is close to 100%. The spatial distribution of the events which are not detected in the second scintillator plane is shown in Fig.2. There are the very few events on the counter surfaces, the four distinct counter boundaries and the areas in the upper and lower parts of the plot. The latter areas are mostly connected with the difference in the vertical acceptance between the first and the second hodoscope planes. The coordinates of these areas are close or beyond the counter edges.

In order to test the criteria near the counter boundaries, it was demanded that no hit was present in all second plane counters, which excludes all coordinate uncertainties. The same areas as in Fig.2 are seen.

From the runs 3347, 3348, 3350, 3352 a total of 390870 events were selected for the efficiency study. 384552 events have hits in the second plane. Thus the average efficiency of the second hodoscope plane is 98.4%. 6318 events have no hits. 3004 (47.5%) of them belong to the boundaries between the scintillators. 1478(23.4%) events belong to the upper and lower areas of a certain counter without a hit.

The determination of the first hodoscope plane efficiency is not possible, because this plane was used to generate the trigger signal. However, the same high efficiency can be expected.

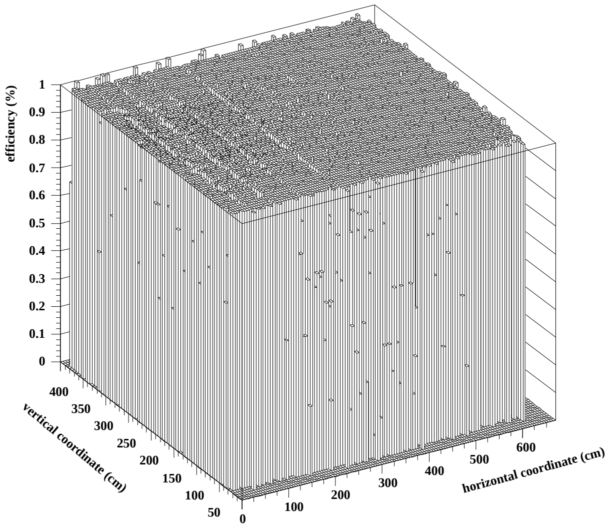

Fig. 1: Efficiency of the second plane in the hodoscope.

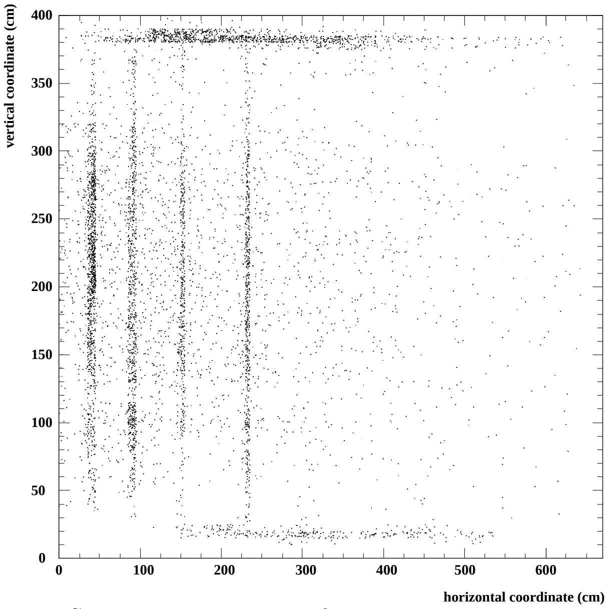

Fig. 2: Spatial distribution of the events which are not detected in the second scintillator plane

References:

[1] S. Dymov et al.,"Luminosity estimation in a_0 January 2001 beam time."(internal report)

[a]ITEP, Moscow, Russia
[b]JINR, Dubna, Russia

Supported by grants RFFI99-02-18179a, DFG-443RUS-113, WTZ-RUS-684-99, RFFI99-0204034, INTAS-98-500, ISTC-1966