Luminosity determination via pp elastic scattering for the ANKE beam time on a_0^+ production*

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Proton-proton elastic scattering was used for the determination of the luminosity, of the ANKE experiment on a_0^+ production at a beam energy of T=2.65 GeV with a H_2 cluster-jet target. Only those events were used for our analysis which were obtained on-line with a single forward-detector (FD) trigger. The corresponding efficiency (dead time) of the DAQ was taken into account. The events belonging to pp elastic scattering reaction were selected from momentum spectra obtained from the MWPC information in the region of $\theta = (5.5 - 9°)$ [1]. The background in pp peak was fitted and subtracted (see fig. 1). The background level in the pp peak was estimated as $\approx$10%. The acceptance from the azimuthal angle distribution is in a good agreement with the GEANT simulations [1](see Fig 2). The tracks were reconstructed with forward MWPCs (FD-MWPC 1 and 2).

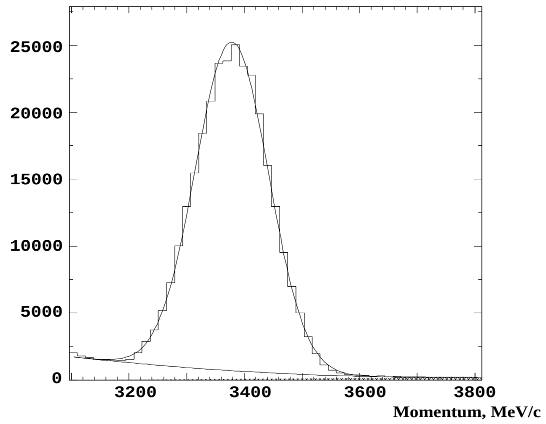

Fig. 1: pp-elastic momentum distribution after taking into accout the FD-MWPC efficiency.

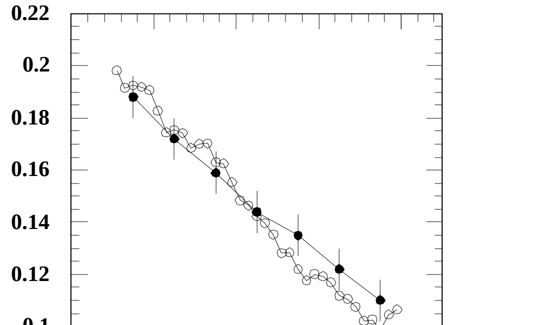

Fig. 2: Acceptance of the forward detection system for the pp elastic events. The solid circles are the acceptances from the azimuthal angle distribution, the empty circles are the acceptances from GEANT simulations.

The data were divided into three groups according to the monitor ratio criteria:

Run	monitor2/monitor3	Npp/trigger2 in
3276-3310	not stable	not stable
3311-3324	stable	not stable
3326-3369	stable	stable

The efficiency maps for these chambers were calculated [2] for each run. Figure 3 shows the average efficiency of the chambers 1 and 2 for the pp elastic events during the January 2001 beam time.

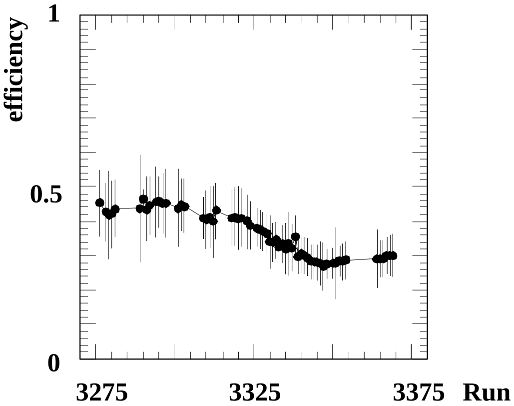

Fig. 3: FD-MWPC efficiency for the pp elastic events in the a_0^+ beam time

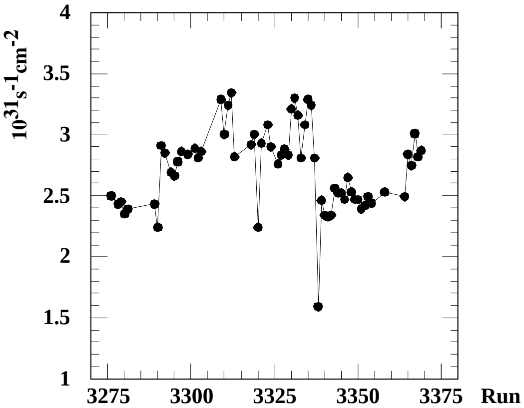

Fig. 4: Luminosity in the a_0^+ beam time

The luminosity was calculated for each run (see Fig. 4) and for all groups.

Run	luminosity ($10^{31}\mathrm{s}^{-1}\mathrm{cm}^{-2}$).
3276-3310	$2.73 \pm 0.55 \pm 0.55$
3311-3324	$2.95 \pm 0.6 \pm 0.55$
3326-3369	$2.69 \pm 0.55 \pm 0.55$

The first error contains all statistical uncertainties, while the second includes the systematical errors. The average luminosity for the a_0^+ beam time is $L = (2.70 \pm 0.55 \pm 0.55) \times 10^{31}\ \mathrm{s}^{-1}\mathrm{cm}^{-2}$. A check of the luminosity determination procedure (including aceptance calculation and the chambers efficiency determination) can be done at lower beam energies where the $pp \to d\pi^+$ reaction is be compared with the pp elastic results [3].

References:

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

[2] S. Dymov,"Determination of the FD MWPC efficiency."(internal report)

[3] P. Fedorets et al.,"Test of the luminosity determination procedure for the ANKE beam time on a_0^+ production."contribution to this Annual Report,p

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