

A Luminosity Monitor with Small Angle Electron Scattering

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For small electron scattering angles the maximum energy of the scattered electron at $x = 1$ is close to the electron beam energy. From kinematics it is also well known that a large x -range is concentrated close to this kinematical limit. This results in a strong peak for the scattered electrons. If one sets a threshold of $0.8 E_{\text{max}}$ for the scattered electrons, the following kinematical range is accepted in the peak for scattering angles of 15° and 30° respectively.

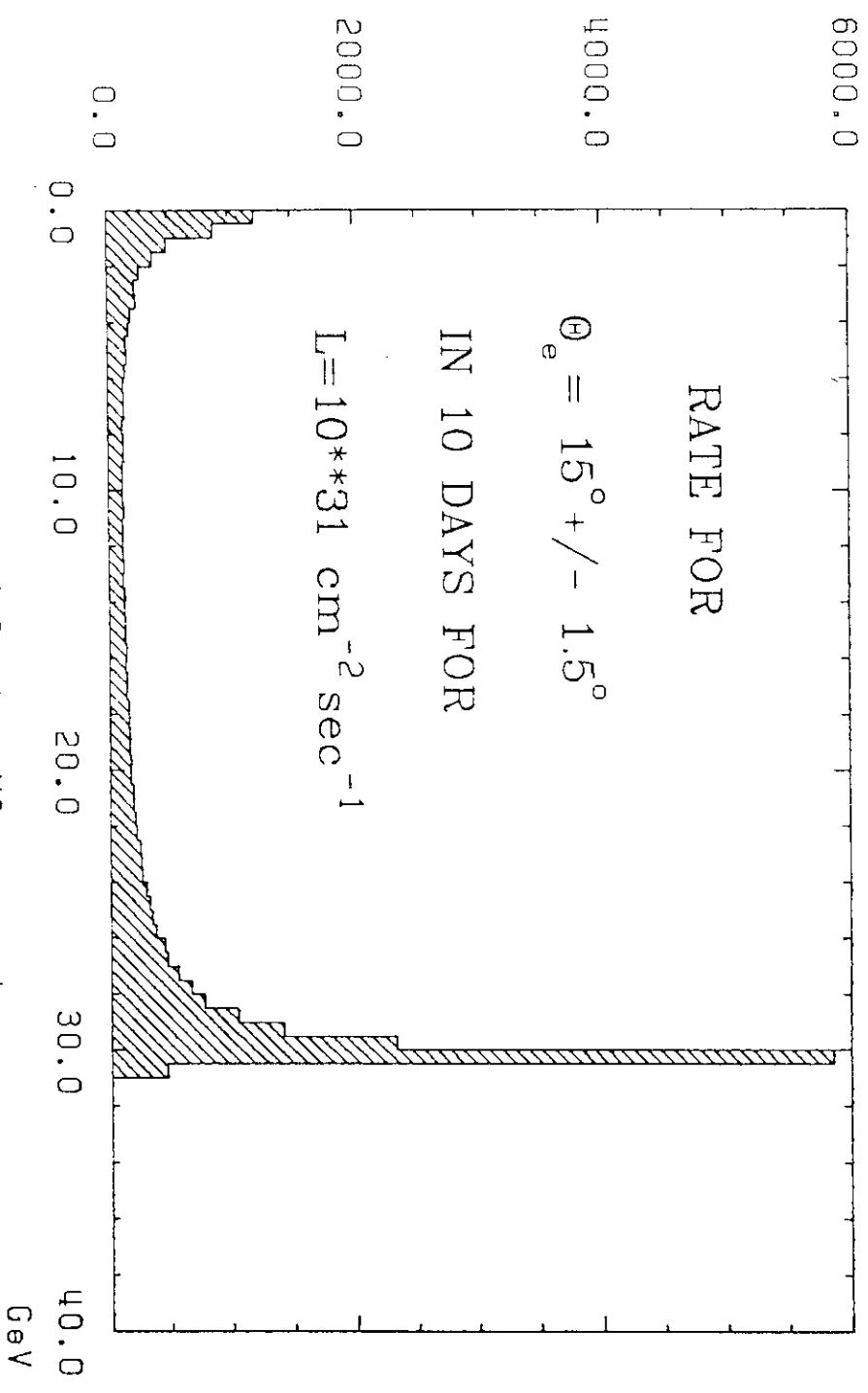
	$\theta_e = 15^\circ$	$\theta_e = 30^\circ$
Q^2 -range	50-60 GeV^2	200-240 GeV^2
x -range	0.002 - 1	0.01 - 1

Fig. 1 and Fig. 2 show the rates for the scattered electrons calculated with the Lund generator for NC events. No radiative corrections are included. From the Figures one can see that the measured rate is quite insensitive to the threshold. This is a great advantage compared to other luminosity monitors. The change of the rate in the peak at $\theta_e = 30^\circ$ is 6 %/mrad.

If one wants to use this monitor as an absolute monitor, one has to extrapolate the known structure functions to smaller x -values. In the Q^2 -range of 50-60 GeV^2 the structure functions are known for $x > 0.1$ which represents only 21 % of the measured rate. This means that the extrapolation from $x = 0.1$ to $x = 0.002$ must be based on solid assumptions.

In addition it should be noted that this electron peak can well be used for an absolute calibration of the electromagnetic calorimeter for $\theta_e \leq 60^\circ$ and for the intercalibration of the tracking detector in this range.

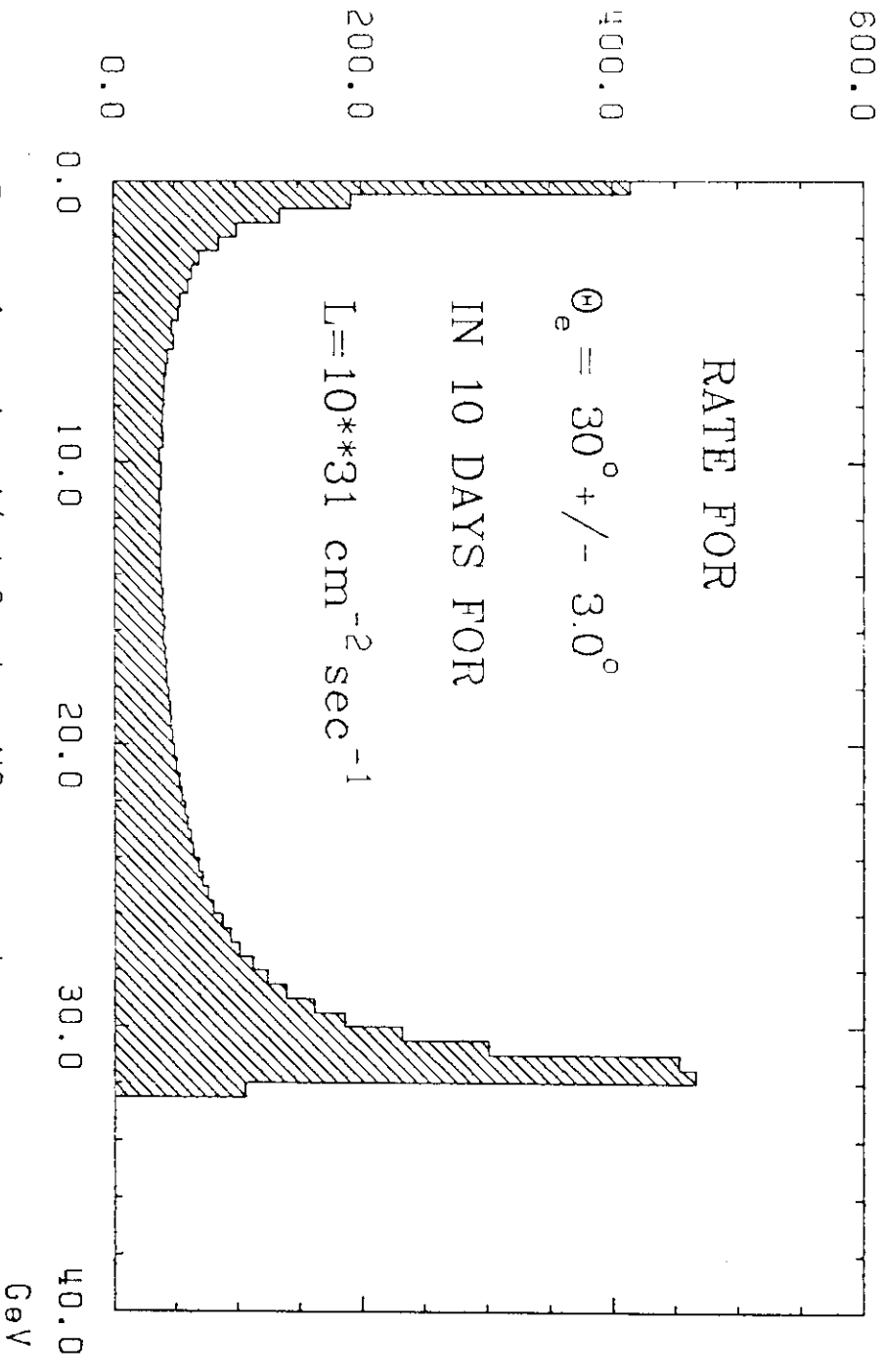
Scattered electrons for Lumi measurement



Rate from Lund/ J.Gayler NC generator
LEPTONSPECTRUM

Fig. 1

Scattered electrons for Lumi measurement



Rate from Lund/ J.Gayler NC generator
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Fig. 2