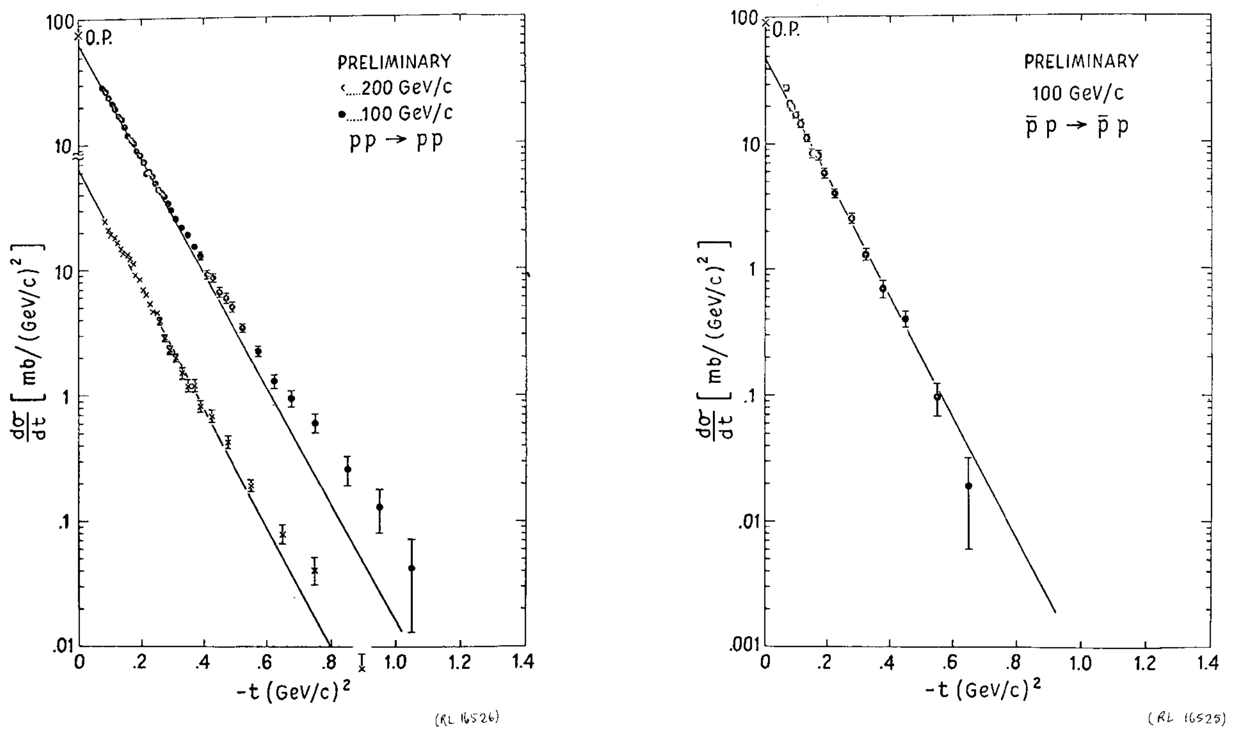

Fig. 1, c and d. Elastic scattering results from FNAL.

References

1. C Akerlof et al, paper 492.
2. D Birnbaum et al, paper 770.

EXPERIMENTAL RESULTS ON LARGE-ANGLE ELASTIC pp SCATTERING AT THE CERN ISR

CERN-Hamburg-Orsay-Vienna Collaboration

Presented by G Flugge

New data in elastic proton-proton scattering have been obtained using the Split Field Magnet (SFM) Detector at the CERN Intersecting Storage Rings (ISR). I am reporting on a preliminary analysis of data in the momentum transfer range 0.8 GeV^2 < -t < 3.0 GeV^2 at the two extreme ISR energies, $\sqrt{s}$ = 23 GeV and $\sqrt{s}$ = 62 GeV.

The obtained cross section data are shown in Diddens' review talk. Their dominant property is the narrow minimum near t = -1.4 GeV^2 which has already been observed at three other ISR energies, $\sqrt{s}$ = 30.45 and 53 GeV by Böhm et al.[1] An upper limit for non-elastic background in our data has been estimated from t-χ^2 scatter plots, where χ^2 is a measure of the deviation from collinearity of the two final state protons. We estimate the background in the t-range of 1.2-3.0 GeV^2 to be less than 3.10^{-3} μb/GeV^2 at $\sqrt{s}$ = 23 GeV and less than 10^{-2} μb/GeV^2 at 62 GeV.

To determine the position of the cross section minimum, we attempt to describe the data by a function[2] of the form

$$(1)\quad \frac{d\sigma}{dt} = A\left| e^{Bt/2} + \sqrt{\frac{C}{A}}\, e^{Dt/2+i\phi}\right|^2$$

where A is the normalization and the four parameters B, C/A, D and ϕ have been found by a maximum likelihood fit. The best fits are shown in the figures if the t distributions (Diddens' talk). The statistics of our data are still rather limited (especially at $\sqrt{s}$ = 62 GeV) and will be considerably improved in the near future. At present we only want to draw two conclusions from the best fits:

The t value of the minimum, as determined using equation (1), is decreasing with energy: (1.45±0.02) GeV^2 at $\sqrt{s}$ = 23 GeV and (1.30±0.05) GeV^2 at $\sqrt{s}$ = 62 GeV. These values are shown in figure 1 together with the results given by Böhm et al.[(1)] The cross section of the second maximum, again as determined using equation[(1)], increases with energy and the values are shown in figure 1. The points of reference 1 in this figure have been obtained using normalization values of dσ/dt (t = 0) from reference 3.

Both observations, the inward moving dip and the upward moving maximum, can be understood as the interference effect[(2)] of a shrinking small t amplitude with a large t amplitude which is energy independent in strength and slope.

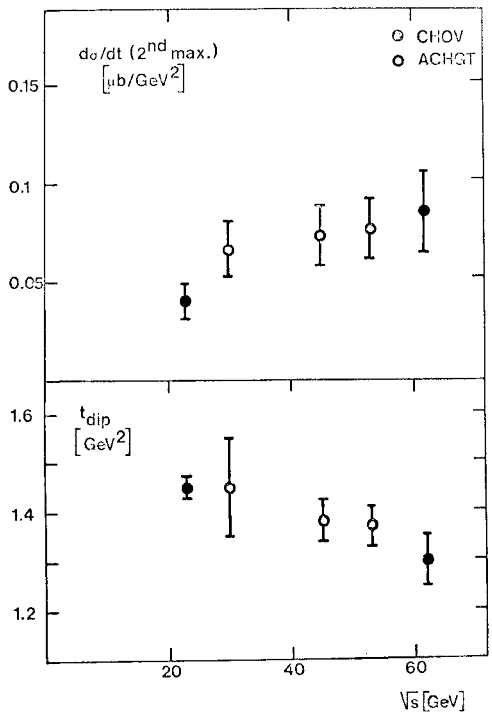

Figure 1a. Differential cross section of the second maximum as a function of energy. The open circles are taken from reference 1.

b. Position of the minimum near t = -1.4 GeV^2 as a function of energy. Open circles from reference 1.

References

1. A Böhm et al, Aachen-CERN-Harvard-Genova-Torino Collaboration., Phys. Lett. 49B(74)491.

2. R J N Phillips, V Barger, Rutherford Laboratory report RL-73-082 (1973).

3. U Amaldi et al, CERN-Roma Collaboration., Phys. Lett. 44B(73)112.