TOTAL CROSS SECTIONS FOR p, $\bar{p}$ AND $\pi^{\pm}$ ON HYDROGEN BETWEEN 5 AND 10.7 GeV/c (*)

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(presented by G. von Dardel)

The total cross sections of particles from the 25 GeV CERN proton synchrotron which were identified by momentum analysis and velocity selection with a gas Čerenkov counter were determined from the transmission through a 3 meter liquid hydrogen target. The results for subtended solid angles of 0.26, 0.45 and 0.9 millisteradians were extrapolated to zero solid angle. For protons the cross sections were 43.7 ± 0.7, 43.7 ± 0.4, 43.3 ± 0.4, 42.1 ± 0.4 and 40.1 ± 0.6 mb at 5,6,7,10 and 10.7 GeV/c respectively, in good agreement with previous measurements at lower energy. The antiproton cross sections were 67.0 ± 2.1, 60.6 ± 2.0, 63.0 ± 2.3, 46.0 ± 2.0, 52.6 ± 2.7 and 53.0 ± 1.1 mb at 5,6,7,10, 10.2 and 10.7 GeV/c respectively. While the antiproton cross section thus approaches the proton cross section the difference is still 12 mb at 10.7 GeV/c.

A series of 15 measurements with π^- yield a constant cross section of 29 to 30 mb with no signs of resonances in the range 4.75 to 10 GeV/c. The data are corrected for an estimated 10% muon contamination in the beam. A measured difference of 1.9 mb at 5 GeV/c and 2.1 mb at 10 GeV/c between the π^--p and π^+-p cross section is attributed to the higher muon contamination from $K_{\mu 2}$ decays in the positive beam. The experimental arrangement and results are shown in Fig. 1-4.

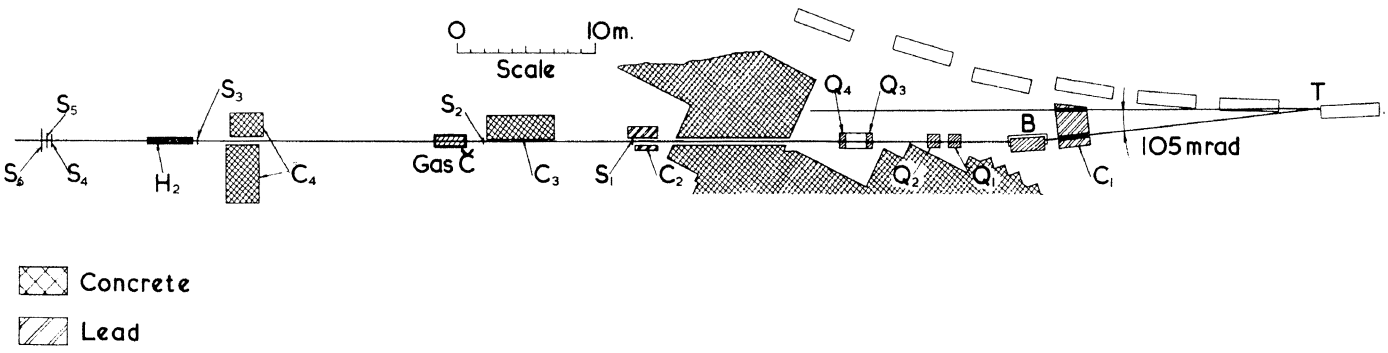

Fig. 1 Experimental layout. C_{1-4} : collimators, B : bending magnet, Q_{1-4} : quadrupole lenses, Č : gas Čerenkov counter, S_{1-6} : scintillators.

(*) A more complete version of this work will be submitted to Physical Review Letters.

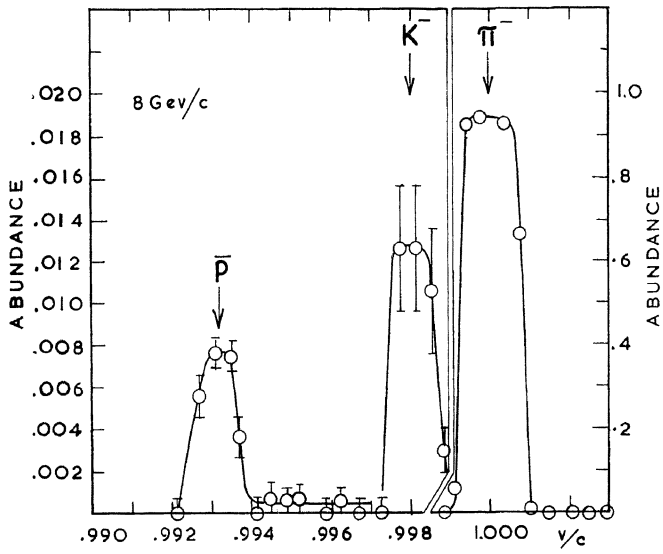

Fig. 2 Velocity spectrum of the negative beam of 8 GeV/c momentum.

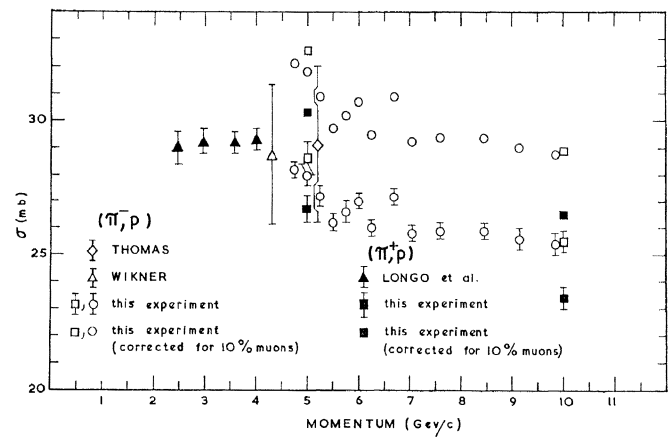

Fig. 4 Total (π^-, p) and (π^+, p) cross sections versus momentum. Square symbols represent measurements with the Čerenkov counter set for pions, circles represent measurements with the whole negative beam.

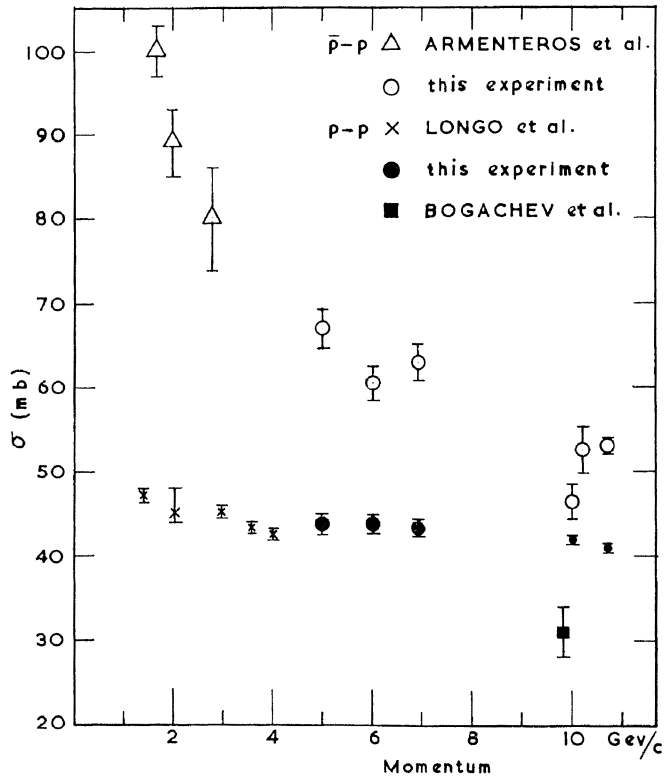

Fig. 3 Total $(\bar{p}, p)$ and (p, p) cross sections versus momentum.

DISCUSSION

CASSELS: Could you say how the results from Dubna, presented this morning relate to your cross section?

VON DARDEL: Chuvilo's value for the π^+-p cross section at the 4.5 GeV/c was 30 ± 1.1 millibarns so it checks very well with the measurements of Longo et al on the π^+-p cross section and is also consistent with our measurements with π^+ and π^-, if we make a correction for a 10% muon contamination.