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M E M O R A N D U M

To : SPSC Members

From : J.D. Dowell

Subject : WA 12 and WA 39 Status Report
Cogne meeting

I attach a brief status report and list of publications from the experiments WA 12 and WA 39 on dimuon production at 40 GeV/c using the Omega spectrometer.

Status of WA12 and WA39; study of dimuon production by $\pi^{\pm}$, $K^{\pm}$, p and $\bar{p}$ at 40 GeV/c using the Omega spectrometer.

WA12 was carried out early in 1977 and yielded the first published result[1] from the SPS on J/ψ production from Cu by all six beam particles. The large $\bar{p}/p$ ratio indicated the importance of valence quark annihilation in the process. Subsequently, results on continuum dimuon production were published[2] completing this experiment. This paper contained the first results for continuum production by π^- at large m^2/s giving a cross section a hundred times larger than that for protons as expected from the Drell-Yan process.

WA39 was carried out in the autumn of 1978 and achieved its aim of obtaining 10 times the statistics of WA12. All the results of the first experiment have been confirmed using a W target[3,4]. In addition scaling with the results of NA3 at 200 and 280 GeV/c is observed within experimental errors. The π^-, π^+ and $(\pi^- - \pi^+)$ cross sections exceed the naive Drell-Yan predictions by a factor ~ 2.4. The pion valence structure function determined from the π^+ and π^- data is compatible within errors with that found by NA3. It is parameterized as $x^{\alpha}(1-x)^{\beta}$ with $\alpha = 0.44 \pm 0.12$ and $\beta = 0.98 \pm 0.15$ to be compared with $\alpha = 0.40 \pm 0.06$ and $\beta = 0.90 \pm 0.06$ from NA3.

According to QCD the average value of P_t^2 would have been expected to behave as a+bs. While such a behaviour is evident for dimuon masses below the J/ψ when compared to higher energy data at fixed m^2/s, $\langle P_t^2 \rangle$ for high masses tends to reach a similar level to that observed at higher energies. In fact a universal behaviour as a function of mass is not in disagreement with the results.

Measurements have also been made on hydrogen from which the A-dependence for J/ψ production has been measured[5] giving $\alpha = 0.98 \pm 0.03$. The average values of P_t^2 are similar

to those observed for W, excluding the possibility of a major contribution from Fermi motion. The π^-/π^+ ratio is greater than unity (1.27 ± 0.14) as would be expected from the quark content of the proton. Results on continuum production from hydrogen have not yet been presented.

The group has no plans for the continuation of these studies. A list of publications is attached.

Publications from WA12

1) Experimental comparison of J/ψ production by $\pi^\pm$, $K^\pm$, p and $\bar{p}$ beams at 39.5 GeV/c.
M.J. Corden et al.
Phys. Letters 68B (1977)96.

2) Production of muon pairs in the continuum region by 39.5 GeV/c $\pi^\pm$, $K^\pm$, p and $\bar{p}$ beams incident on a copper target.
M.J. Corden et al.
Phys. Letters 76B (1978)226

Publications from WA39

3) Experimental results on J/ψ production by $\pi^\pm$, $K^\pm$, p and $\bar{p}$ beams at 39.5 GeV/c.
M.J. Corden et al. Submitted to Phys. Letters and presented at Madison 1980 Int. Conf. on High Energy Physics.

4) Production of muon pairs in the continuum region by 39.5 GeV/c $\pi^\pm$, $K^\pm$, p and $\bar{p}$ beams incident on a tungsten target.
M.J. Corden et al. Submitted to Phs. Letters and presented at Madison 1980 Int. Conf. on High Energy Physics.

5) Experimental results on J/ψ production by $\pi^\pm$, $K^\pm$, p and $\bar{p}$ beams on hydrogen at 39.5 GeV/c.
M.J. Corden et al. Submitted to Phys, Letters.