ANALYSIS OF THE CENTRAL $K^0_S K^{\pm}\pi^{\mp}$ SYSTEM AND DETERMINATION OF THE $f_1(1285)$ BRANCHING RATIO AT 450 GeV/c

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Synopsis

This thesis presents the latest results from the WA91 experiment. The experiment selects central production reactions of the type $pp \rightarrow p_f (X^0)\ p_s$ at 450 GeV/c where s and f indicates fastest and slowest particles in the laboratory frame and X^0 is the central system.

The development of code to recover V^0 vertices for the WA91 experiment is described. This code has been implemented to study channels involving K^0's. The number of K^0 s recovered by the code represented 38% of the total number available.

In the centrally produced $K^0_S K^\pm \pi^\mp$ system, clear signals for both the $f_1(1285)$ and the $f_1(1420)$ are seen. Spin-parity analysis of both mesons using Zemach tensor formalism determined that both states have quantum numbers $J^{PG} = 1^{++}$. The $f_1(1285)$ was found to decay *via* the $a_0(980)\pi$ intermediate step. The $f_1(1420)$ was found to decay *via* $K^*\overline{K}$ only, no 0^{-+} wave being required to explain the observed data. When comparison is made with 85 and 300 GeV/c central $K^0_S K^\pm \pi^\mp$ data, the relative proportion of $f_1(1285)$ to $f_1(1420)$ is found to be consistent with 300 GeV/c data, and lower than that at 85 GeV/c, indicating different energy dependences for $f_1(1285)$ and $f_1(1420)$ production.

The branching ratio

$$\frac{f_1(1285) \rightarrow K\overline{K}\pi}{f_1(1285) \rightarrow 4\pi}$$

has been determined from the $K^0_S K^\pm \pi^\mp$ and $\pi^+\pi^-\pi^+\pi^-$ channels to be 0.29 ± 0.07, consistent with the Particle Data Group value.