STATUS REPORT ON EXPERIMENT PS172:

\[ \bar{p}p \text{ TOTAL CROSS SECTION AND SPIN EFFECTS IN } \bar{p}p \rightarrow K^+K^-, \pi^+\pi^- \text{ AND } \bar{p}p \]

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INTRODUCTION

In the beginning of 1980 four letters of intent for experiments at LEAR had been submitted which all proposed to study either $pp$ total cross section or spin effects in $pp$ (elastic) scattering or both. The people who wrote these letters were asked to work together and to submit one proposal covering all the experiments mentioned in the original letter of intent. The proposal resulting from this effort suggests to do a wide range of experiments using a rather complicated set up.

The main objective of the proposal is a measurement of $d\sigma/d\Omega$ and $P$ in

\begin{align*}
\bar{p}p &\rightarrow \pi^+\pi^- \quad (1) \\
\bar{p}p &\rightarrow K^+K^- \quad (2) \\
\bar{p}p &\rightarrow \bar{p}p \quad (3)
\end{align*}

in the momentum range of 300 - 2000 MeV/c at about 15 different momenta using a conventional polarized target. In reactions (1) and (2) the complete angular range $0 - 180^\circ$ will be covered while reaction (3) will be studied over the angular range where $p$ and $\bar{p}$ have sufficient energy to escape from the target. Statistics will be $> 10^4$ per momentum for reaction (2) and correspondingly higher for the other channels.

Differential cross sections have been measured for reactions (1) - (3) with reasonable accuracy from 690 - 2430 MeV/c and polarisation in reactions (1) and (2) above 2 GeV/c. The $\pi^+\pi^-$ data show pronounced structure and several broad resonances seem to be present. For reaction (3) the polarisation has been measured from 910 to 2970 MeV/c but the statistics are such that it is difficult to draw any conclusions about resonances.

At the same time as one measures these differential cross sections the polarisation of the outgoing proton can be measured in reaction (3) in order to obtain the Wolfenstein parameter $I(o,n ; o,n)$. If carbon has sufficient analysing power for the polarisation of antiprotons also the parameter $I(o,n ; n,o)$ will be obtained.

The main experiment will be preceded by two short introductory experiments. One is a measurement of the analysing power of carbon for the polarisation of antiprotons. This information is not only needed for the measurement of $I(o,n ; n,o)$ but will also decide on the feasibility of polarised antiproton beams.

The same apparatus will be used to measure the phase of the scattering amplitude of $\bar{p}p$ elastic scattering near $|t| = 0$. 