Rutherford Laboratory

Technical Leaflet

B1

Π1 BEAM LINE AND EXPERIMENT

(N.I.R.N.S. Group)

The π 1 experiment is designed to produce more information on a resonance process that is known to occur when negative pions with a momentum of 1.03 GeV/c are scattered from protons. The reaction studied is the elastic scattering process $\pi^{\mp} p \rightarrow \pi^{-} + p$ in the momentum range of 0.9-1.5 GeV/c.

The experiment is to be made in two parts and the apparatus exhibited is for the first part of the experiment which studies the variation of the number of elastically scattered pi-mesons with scattering angle.

The pi-mesons are produced by bombarding a target in NIMROD with the circulating proton beam. Pi-mesons from this internal target are transported through the shielding wall and on to a liquid hydrogen target. During transport the particles are selected for charge and momentum by bending magnets while magnetic focusing lenses prevent loss of the required pi-mesons from the beam.

Negative pi-mesons incident on the hydrogen target scatter off protons in the hydrogen and produce recoil protons. About fifty scintillation counters are arranged in an arc around the hydrogen target and these detect both the scattered pi-meson and the recoil proton. Each scintillation counter covers a known angular range and electronic techniques are used to decide if a particular pi-meson and proton have in fact originated from the elastic process being studied. If the correlation is satisfactory, the event and respective scattering angles for the pi-meson and the proton are recorded.

Over part of the angular range studied the kinematics of the reaction do not permit differentiation between the scattered pi-meson and the recoil proton. Water Cherenkov counters are used to detect the faster pi-mesons. The slower protons give no Cherenkov light.