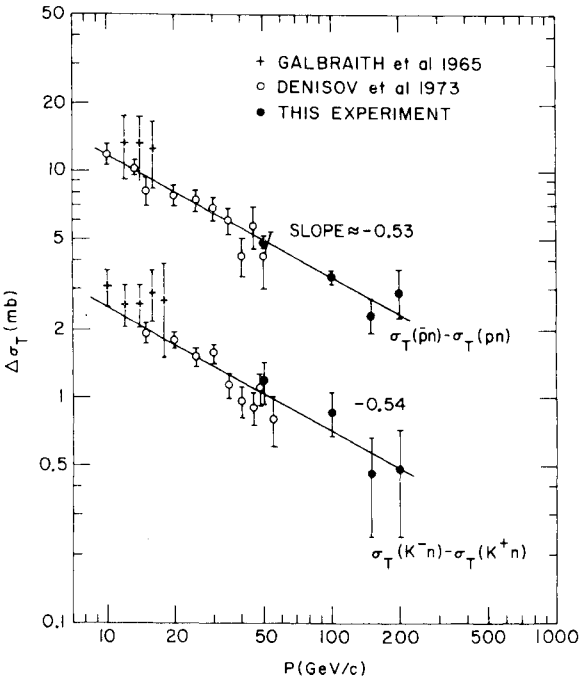

References (cont.)

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Figure 5: Results of this experiment, together with previous data for total cross section differences: $\sigma_T(\bar{p}\,n)-\sigma_T(p\,n)$, $\sigma_T(K^-n)-\sigma_T(K^+n)$

(RL 16605)

THE REACTIONS $\pi^- p \to \eta n$ AND $\pi^- p \to X^o n$ AT 15 AND 40 GeV/c

CERN-Serpukhov Collaboration (IHEP-Karlsruhe-Pisa Vienna)

Presented by M L Vincelli

Data on $\pi^- p$ charge exchange interactions giving a recoil neutron and a forward-produced state which decays in a final state containing only γ rays ($\pi^o \to 2\gamma$, $\eta \to 2\gamma$, $\omega \to \pi^o\gamma$, $X^o \to 2\gamma$, $\pi^o\pi^o$, etc) are being collected at the Serpukhov accelerator at incident π^- momenta between 15 and about 40 GeV/c by a IHEP-CERN (Karlsruhe-Pisa-Vienna) group. Preliminary results are reported for the differential cross section of the reactions $\pi^- p \to \eta n$ and $\pi^- p \to X^o n$ up to $t \simeq 2(\text{GeV/c})^2$ for η and $t \simeq 1\ (\text{GeV/c})^2$ for X^o (papers 536 and 537).

The γ rays from the meson decays are detected by a multiphoton spectrometer consisting of 648 iron-plastic scintillator sandwich counters arranged in 1-m diameter hodoscope.

The disposition of the counters is shown in Fig. 1.

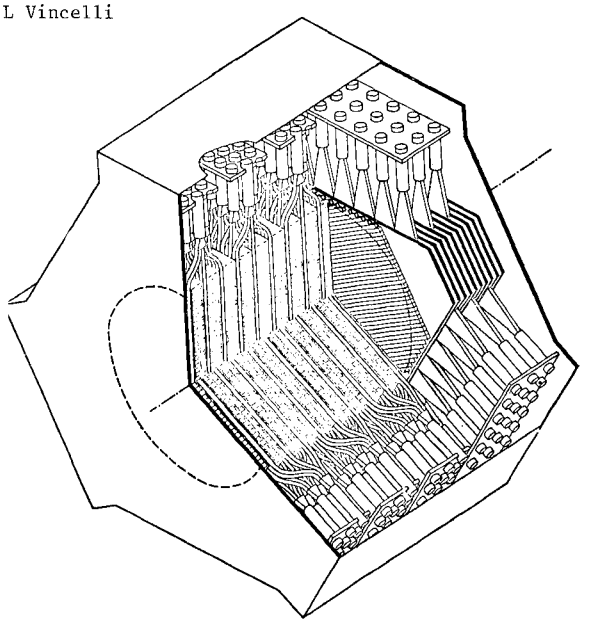

Fig. 1 The photon detector (RL 16604)

For the first 27 layers the scintillators are 1.5 cm wide, for the last 7 layers 12 cm. Subsequent layers are rotated by 120^o around the beam axis.

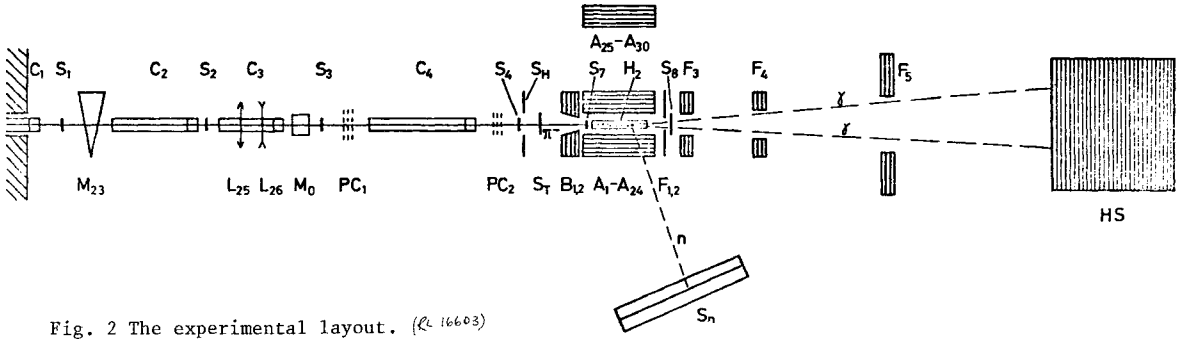

Fig. 2 The experimental layout. (RL 16603)

By measuring the pulse heights, and with proper calibration, it has been found that the position resolution on the point of conversion of a photon is ±2 mm and its energy is measured with 8% (FWHM) resolution at 40 GeV/c and 12% at 25 GeV/c. This technique allows incident beams of up to (2-3) x 10^{+6} π^-/sec and data collection at a rate more than an order of magnitude faster than in previous experiments.

The point of interaction in the liquid H_2 target is located within ±4 cm by measuring the Cerenkov light produced by the π^-. The target is surrounded by veto counters (Fig.2); other Pb-scintillation veto counters define the acceptance solid in the forward direction. The pulse height from each veto counter surrounding the target is recorded and used off line to reject events accompanied by large angle photons without vetoing the cases in which the recoil neutron interacts in the counters or in the γ converters. For the present preliminary analysis, however, only a fixed suitable threshold has been imposed on the pulse height.

A set of 16 neutron counters, covering 1/20 of the azimuthal angle, detects neutron recoils for about 2% of the events.

The trigger accepts all interactions with no charged particles produced. Two γ events are selected by correlating the showers seen by the spectrometer counters in the three 120° directions. The efficiency of the program has been checked by looking at a computor display which gives all relevant information in a compact form. The distribution of invariant mass for a sample of γ-pairs is shown in Fig. 3: no background appears in the region between the π^0 and the η peak.

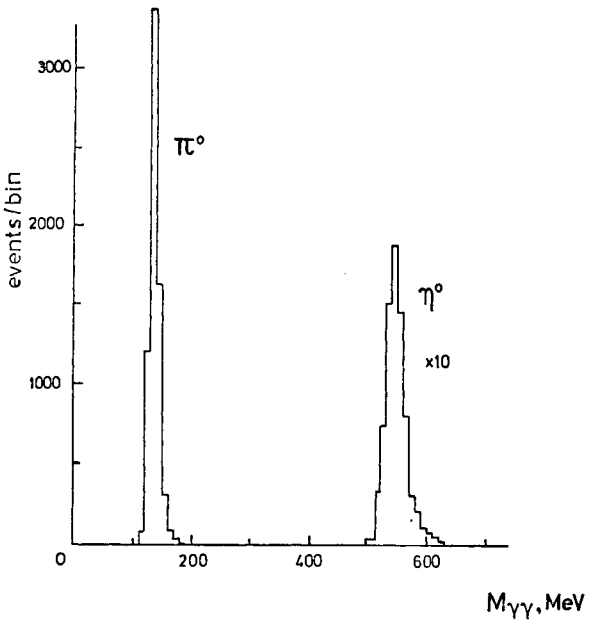

Fig. 3 Two-photon mass distribution (IC fit) at 40 GeV/c. (RL 16602)