CERN/ISRC/69-11/Add(II)
June, 1969.

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

INTERSECTING STORAGE RINGS COMMITTEE

Addendum(II) to :

THE STUDY OF INTERACTIONS IN WHICH γ RAYS AND ELECTRONS WITH LARGE TRANSVERSE MOMENTUM ARE EMITTED.

J.CHEZE - J.L.HAMEL - A.V.STIRLING - J.TEIGER - B.THEVENET - G.VALLADAS - J.ZSEMBERY -

D.Ph.P.E. - C.E.N. SACLAY

et

M.CROISSIAUX et J.P.PAHIN

Centre de Recherches Nucléaires de STRASBOURG.

The experimental programme we have defined in our preliminary proposal [1] is the following :

Measurement of the spectra of γ rays and electrons emitted with large transverse momentum.

The apparatus consists essentially of a Cerenkov electron counter plus an electron shoxer detector.

The particle identification, the discrimination against charged π, K, and the discrimination against the electron background from Dalitz pairs and γ-ray materialisation has been discussed extensively in a previous addendum [2].

We have also defined an experimental programme for the measurement of the γ ray spectra and shown that the contamination problem would be negligible compared to the number of observed events.

In this paper we would like to give some indications on the measurement of the electron spectrum.

Measurement of the electron spectrum.

With the proposed experimental arrangement, the production of high energy electrons with momenta larger than 2 GeV/c can be explored down to low production cross section $\sigma \sim 10^{-34}$ cm^2 in a reasonable running time $\tau \sim 50$ hours with the ISR luminosity close to $\sim 4\ 10^{30}$ cm^{-2} sec^{-1} [1].

The total number of $\pi^{\pm}$ going through the same large solid angle detector as used for the γ ray measurement with a solid angle $\Delta\Omega \sim \frac{\pi}{2}$, in a period $\tau \sim 50$ hours, is reproduced in the following

... / ...

table as well as the expected δ-ray contamination in the Cerenkov counter [2].

Momentum interval GeV/c	Total number $\pi^{\pm}$ $\tau \sim 50$ hours	Cerenkov Counter δ-ray contamination
1.5 - 2.5	$\sim 10^8$	$\sim 2\ 10^3$
$P_\pi \geqslant 2.5$	$\sim 10^6$	~ 50

The further $\pi^{\pm}$, $K^{\pm}$ discrimination obtained from the spark chamber assembly has been discussed at length in our preceding addendum [2]. It is thus clear that the $\pi^{\pm}$ contamination in the electron spectrum will be reduced to an extremely low level for momenta above $P \sim 2.0$ to 2.5 GeV/c.

Furthermore the correction for the few possibly misidentified $\pi^{\pm}$ events in the electron spectra will be carefully calculated from our preliminary calibration tests of the detectors in pion and electron beams from SATURNE.

The number of π° expected to decay in γ rays in the detector solid angle $\Delta\Omega \sim \frac{\pi}{2}$ is given in the following table :

Momentum Interval GeV/c	Total number of π° $\tau \sim 50$ hours
1.5 - 2.5	$6\ 10^7$
$P \geqslant 2.5$	$5\ 10^5$

The discrimination against electrons issued from Dalitz pairs and γ ray materialisation has been carefully evaluated in our

... / ...

preceding addendum [2].

It will be quite sufficient to eliminate most of the electrons issued from π° decay for momenta above $Pe \geqslant 2.0$ GeV/c.

Furthermore the electron background from Dalitz pairs and γ ray materialization will be precisely calculated from our previous γ ray spectra measurements.

These preliminary measurements of the spectra of γ ray and electrons with large transverse momenta above $P \sim 2.0$ GeV/c in a short running time will certainly provide useful information : in particular an upper limit for the production cross section of reactions in which large transverse momentum electrons might be produced. This upper limit in this experiment will be as low as $\sigma \sim 10^{-34}$ cm^2.

These measurements will also provide useful data on the following spectra : $\gamma\gamma$ and π° events - e^+e^- pairs - $\pi^\pm \pi^\circ$ decays and large angle multiple pion production processes.

CONCLUSION.

We propose to measure the γ's and e's spectra during a few runs of 50 hours.