FNAL Proposal

Study of cascade showers initiated by electrons.

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The Purpose of the Experiment.

In the course of studying 303 and 400 GeV/c proton interactions (FNAL Proposal No.242 and No.243), we observed 3 direct electron events (Table 1). The energy of each electron was estimated by the usual cascade method applyed to γ rays. The method was calibrated by making invariant mass distributions of two γ rays and finding π^0 peak (Fig. 1). We feel, however, this is not sufficient to make accurate estimation of the electron energy.

Therefore, we wish to make calibration of the method for energy determination on electrons, irradiating electrons with definite energy on the emulsion chambers of the same design as those of proposals No.156, No.242 and No.243 (Fig. 2).

Detectors.

The detectors are emulsion chambers consisting of nuclear emulsions and thin lead or tungsten absorvers. Each chamber has a size of 12cm×9cm×5∿14cm. Number of chambers will be 6.

Conditions required.

Conditions required in this experiment are quite parallel to the proposal No.340 by Dr.Dake.

(1) Beam; parallel and mono-energetic electron beam.

(2) Energy of the irradiated electron; several points between 50 GeV and the maximum energy.

(3) Accuracy of the beam energy; better than ∿±5% (absolute) ∿±3% (relative)

(4) Amounts of irradiation; 5∿10 electrons/cm^2 on each detector.

Table 1.

Direct electron events

Event	E (GeV)	θ (rad.)	P_T (GeV/c)	Remarks
303Pb1-27	13	4.5×10^{-2}	0.59	Knee* $P_{//}$max.ch.'s P_T = 1.1 GeV/c
400W1-32	155	3.3×10^{-3}	0.51	$P_{//}$ max.ch.'s P_T = 2.1GeV/c
400-W2-4	~20	2.2×10^{-2}	~0.4	

*

θ (rad.)	Δθ (rad.)	P_T (GeV/c)	ℓ (m.m)
1.6×10^{-2}	1.08×10^{-1}	1.1	11.9

Fig. 1

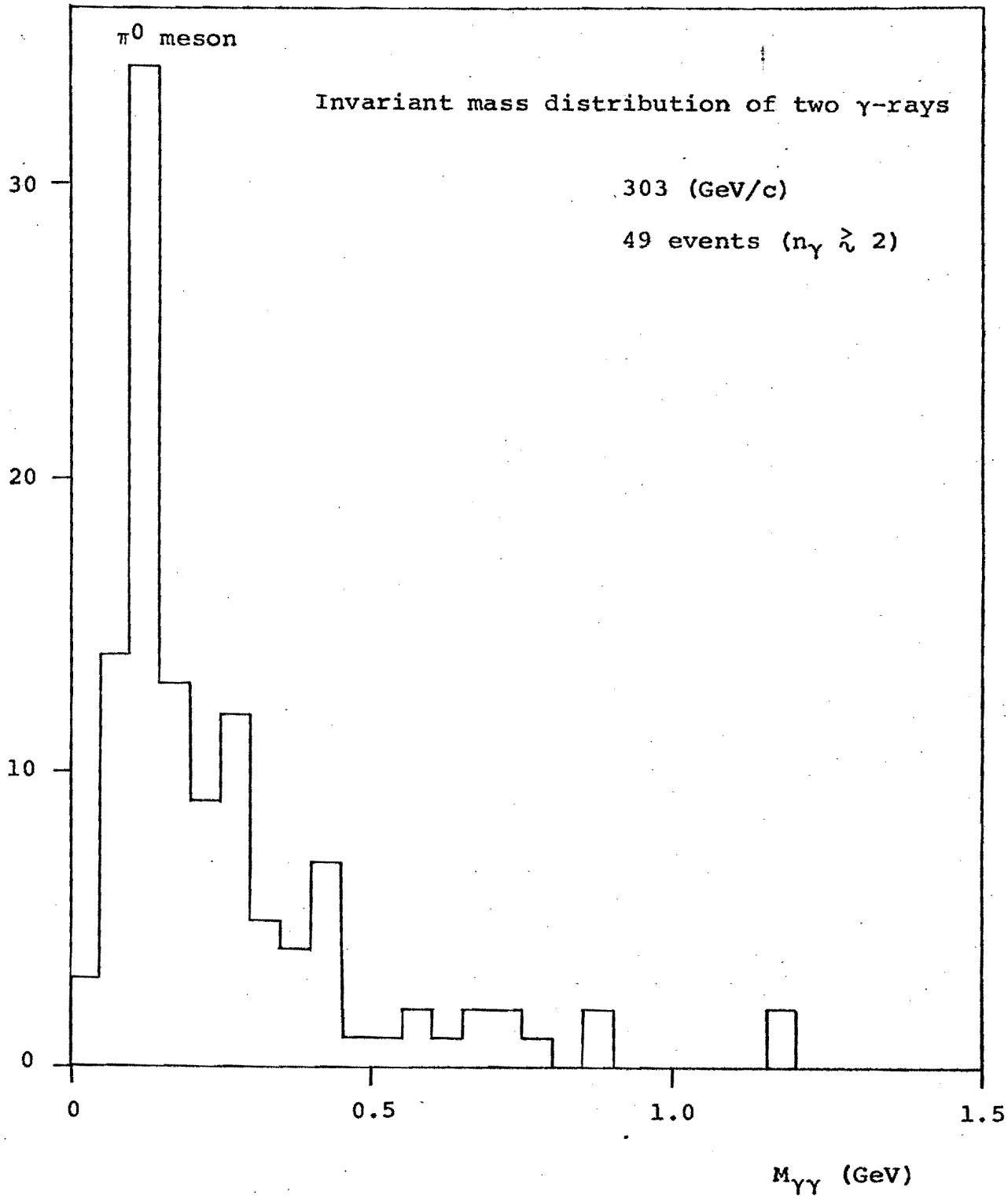
π^0 meson
Invariant mass distribution of two γ-rays
303 (GeV/c)
49 events ($n_\gamma \gtrsim 2$)
30
20
10
0
0
0.5
1.0
1.5
$M_{\gamma\gamma}$ (GeV)

Figure 2. Emulsion Chamber